THE CAREER EXPERIENCES OF WOMEN IN STEM FIELDS IN LEBANON

A Dissertation

by

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ABSTRACT

This basic qualitative study explored the career experiences of women working in STEM fields in Lebanon. Guided by career construction theory (Savickas, 2002), I conducted individual, in-depth, semi-structured interviews with 21 women in Lebanon to address the study's three research questions: "what leads women to enter STEM fields in Lebanon?", "what are the career experiences of women professionals in STEM fields in Lebanon?", and "what impacts women's experiences in STEM careers in Lebanon?".

The study participant's, each having at least eight years of experience in their field, reflected on how they constructed their STEM careers in Lebanon. Five categories were identified from the data analysis: (a) vocational choice; (b) career accomplishments; (c) career challenges; (d) coping strategies; and (e) career reflection.

Findings from this study highlight the internal characteristics that a woman should embody to pursue a career in STEM as well as the constant career reflection that she would be engaging in throughout her career. Specifically, the findings suggest that the organizational practices such as performance appraisals, availability of mentors, and access to network and financial capital are gendered and reflect the institutional context of Lebanon (i.e., the legal system, capital market, education system, culture, and relational influences), which act as constraints to women's career in STEM fields. The organizational practices evolve as a consequence of the never-ending interplay between changes in the institutional context within which organizations are embedded and the larger macro environment. This interplay further perpetuates a gendered and masculine

ideal with respect to STEM employees. Against this backdrop, this study enhances our understanding of the career experiences of women in STEM in Lebanon by showcasing the strategies that the women adopt to cope with the outcomes of the previously discussed interplays between the institutional factors and the organizational practices. The various coping strategies that the women use either reinforce, reproduce or challenge the gendered and masculine ideal in STEM.

Based on the findings from this study, I propose a new conceptual framework for career construction theory, highlighting the role of relationships, context and time. I conclude the study by discussing implications for practice both at the national and organizational levels and suggesting areas for future research.

DEDICATION

To my uncle Hadi, who chose to live differently.

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Third, I am grateful for the 21 women who took part in this study: Thank you for allowing me to share your career experiences in STEM. I hope you find I did your stories justice.

Most of all, I am grateful to my parents, Ghazi and Wassilia, and to my sisters, Shireen, Dima, and Rand, for creating a home environment that regards education to be one of the noblest pursuits in one's life. I am grateful for the support that they have offered me and for their countless messages, emails, and calls of encouragement and most importantly their presence in my life. In more ways than one, they are my backbone and I am indebted to all their sacrifices and love.

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CHAPTER I

INTRODUCTION

In this introductory chapter, I provide an overview of the topic of this dissertation and its overall purpose and research questions. I also present an overview of the theoretical foundation, the research design I employ, and the study's significance. I conclude the chapter with defining the boundaries of the study and key terms used throughout the dissertation.

Background of the Study

Despite the advancement women have made in the professional world, women in science, technology, engineering, and mathematics (STEM) fields continue to be a minority group (Blickenstaff, 2005; Buck *et al.*, 2008; Morganson *et al.*, 2010). From a global perspective, women accounted for less than one third (28.8%) of the workforce in scientific research and development across the world in 2014 (Catalyst, 2018). From a local perspective, women's representation in STEM occupations vary greatly by country and by field. For instance, in the U.S., women hold 44% of all science occupations, including 45% of physical scientists; however, they represent only 14.5% of all architectural and engineering occupations, and even fewer in civil engineering (11%) (Bureau of Labor Statistics, 2016). In Australia, women make up 20.7% of employers in computer system design and even less (12.4%) in engineering (Catalyst, 2018). In the European Union (EU), women have made a noticeable progress toward reducing the gender gap, as evidenced by 40.1% of representation in science and engineering in 2016, an increase of more than 20% since 2007 (Catalyst, 2018). Nevertheless, this progress is

inconsistent across the STEM fields. For example, the number of women in technology sectors in the EU is relatively smaller (32.2%) than the number of women in science and engineering (40.1%) (Catalyst, 2018).

Career exit for women in science, engineering, and technology (SET) peaks about ten years into their careers (Center for Work-Life Policy, 2008). On the global scale, nearly one third of women in the United States (32%) and China (30%) intend to leave their SET jobs within their first year, followed by Brazil (22%) and India (20%) (Center for Talent Innovation, 2014). And in certain industry sectors, the turnover rate is even more concerning. For example, in technology intensive industries globally, 53% of women have opted to leave for other industries, compared to 31% of men (Catalyst, 2014). Among women who earned engineering degrees, 38% quit engineering or never even entered the profession (Catalyst, 2018).

A number of reasons for women's career exit from STEM occupations have been identified by researchers. A few prominent examples include gender bias (Buse and Bilimoria, 2014; Dasgupta and Stout, 2014; Hart, 2016), feeling of isolation, hostile male-dominated work environments (Hewlett *et al.,* 2008), ineffective executive feedback, and a lack of adequate sponsorship (Center for Talent Innovation, 2014). More specifically, women working in STEM often found themselves challenged by gendered organizational structures, cultures, and practices, all of which have created barriers to their career advancement and acceptance as professionals (Acker, 1990; Bastalich *et al.,* 2007; Blickenstaff, 2005). These barriers are rooted in the unique characteristics of STEM fields— being largely male-dominated (Stout *et al.,* 2016)—as a result, women

are often not welcomed. In this respect, researchers reminded us that stereotypical assumptions of STEM women are deeply entrenched with masculine norms of behaviors incongruous with the female gender role (Cheryan *et al.*, 2009; Diekman and Steinberg, 2013). Examples of these stereotypes that exist in STEM fields include a tendency toward social isolation and singular focus on technology (Hill *et al.*, 2010). Further, researchers recognized that women opted out of STEM careers because they were perceived as being incompatible with traditionally accepted feminine roles, values, identities, and life goals (Ahlqvist *et al.*, 2013; Diekman and Steinberg, 2013). Because gender roles shape the way people see themselves (Eagly, 2013), women have reported feeling different from people who fit into STEM stereotypes (Cheryan *et al.*, 2009) and are discouraged to continue pursuing their STEM careers.

In the Arab Middle East and the Lebanese context in specific, the percentage of women working in STEM fields is significantly low (WEF, 2016). Women in Lebanon account for close to 31% (WEF, 2016) of the entire workforce; however, they are primarily employed in sectors such as healthcare, education and government. Furthermore, while the number of women who graduate from STEM education in Lebanon is around 18% (WEF, 2016), the number of women who have pursued a STEM career upon graduation has significantly dropped to 5% (WEF, 2016). In addition, data on women in STEM in Lebanon is scarce as the primary focus of various United Nations Development Program (UNDP) reports (2002, 2003, 2008, 2012, 2015) and UNESCO reports (2007, 2009, 2014) is on the status of women in STEM at the regional level (i.e., the Middle East and North Africa). Such a general focus overlooks the unique country

differences and their impact on the career experiences of women in STEM, at a local level. As a result, we know little about women's experiences, challenges and motivation in various STEM fields in Lebanon, although their participation in the workforce is increasing.

Purpose and Research Questions

This dissertation study was conducted to fill in the gaps identified above. The overarching purpose is to explore the career experiences of women in STEM fields in Lebanon. The following three research questions guided my study:

1. What leads women to enter STEM fields in Lebanon?
2. What are the career experiences of women in STEM fields in Lebanon?
3. What impacts women's experiences in STEM careers in Lebanon?

Theoretical Framework

The career experiences of women in STEM in Lebanon was studied from a career theoretical lens. Specifically, I leveraged the tenants of career construction theory (Savickas, 2002) to better explore and understand the women's experiences. The career construction theory also aligns with my philosophical view (i.e. constructivist). The theory of career construction by Savickas (2002) updates and advances Super's (1957) seminal theory of vocational development for use in a multicultural society and global economy. Savickas' theory addresses "how the career world is made through personal constructivism and social constructionism" (Savickas, 2002, p.43). In career construction theory, career development is driven by an adaptation to the environment, rather than by an individual's inner maturation. Individuals construct their careers by imposing

meaning on their own vocational behavior and occupational experiences. Savicaks (2002) defines a career from a subjective perspective that is mainly concerned with the patterning of experiences allowing for a holistic and meaningful understanding of the career story. According to Savickas (2002), a career is "a subjective construction that imposes meaning on memories, present experiences, and future aspirations by weaving them into a life theme that patterns that individuals' work life" (Savickas, 2002, p. 43).

Through career stories, individuals narrate their work experiences and highlight particular examples that shed light on their active process of meaning making. Career construction theory focuses on how an individual develops the *what, how,* and *why* of making a career decision through a narrative approach (Glavin & Berger, 2012). Career construction theory addresses three components: (a) the psychology of individual differences, (b) the psychology of development, and (c) the psychology of motivation (Savickas, 2005, 2011). The psychology of individual differences relates to the content of vocational personality (i.e., *what* different people prefer to do). The psychology of development relates to the process of adaptation (i.e., *how* individuals deal with vocational tasks and work related challenges). The psychology of motivation relates to *why* a certain career choice is made and which life themes make meanings and lead to certain vocational behaviors (i.e. calling). Savickas (2005) suggests that these three perspectives are central components when constructing an individual's career.

In Chapter II, I discuss in depth the various career development theories relevant to this study with a focus on career construction theory. My understanding of the topic of

the dissertation is also informed by the existing empirical literature on careers of women in STEM, which I will also review in the chapter.

Overview of Research Design

This study is informed by a constructivist philosophical perspective, which has also influenced my methodological choice. Specifically, I adopted the basic qualitative research methodology to guide my study as it is informed by the constructivist epistemology (Lincoln & Guba, 1985; Merriam, 2009; Merriam & Tisdell, 2016). I recruited my study participants through my personal and professional contacts and the snowball sampling strategy. I conducted two rounds of face-to-face interviews 21 women who work in various STEM fields in Lebanon. Interviews were recorded with participants' consent and transcribed verbatim for analysis. I then used the constant comparative method to extract categories and themes. To ensure trustworthiness (rigor) of the study, I used member checking, reflexive journaling, and peer debriefing techniques (Lincoln & Guba, 1985).

Significance of the Study

This study contributes to the literature in five ways. First, taken together, the status of women in STEM fields and their career experiences represent an ongoing challenge for human resource development (HRD) professionals. Specifically, HRD consists of three core domains of research and practice: training and development (T&D), organization development (OD), and career development (CD) for the purpose of improving performance and organizational and individual effectiveness (McLagan, 1989; Swanson & Holton, 2001). However, among these three areas, career development

has received the least research attention (Swanson & Holton, 2001). Thus, this study expands the current knowledge of career development within the field of HRD.

Second, the career experiences of women in STEM fields have been hardly studied in HRD (Catalyst, 2018). Understanding their career experiences will contribute to HRD research and practice and will allow HRD professionals to be cognizant about the underrepresentation of women in STEM fields and be better equipped to identify ways to attract and retain women in STEM careers. STEM occupations that fail to attract and retain women result in a loss of diverse perspectives essential for the creation of STEM technology and innovation (Blickenstaff, 2005) and further perpetuate gender inequality in the workplace (Beede et al., 2011). Further, as job opportunities in STEM fields were projected to grow five times faster than other sectors in the upcoming years and the supply of talent is not expected to meet the talent need (Hewlett et al., 2008), attracting and retaining women in these historically male-dominated occupations will be a necessary solution to meet the increasing demand for a STEM workforce. The lack of active participation of women in STEM professions inhibits a nation from reaching its full potential and impacts its global competitiveness and long-term economic growth. It is hoped that this study will provide deep insights into the women's experiences and unpack how the women interpret and give meaning to their career experiences in STEM fields.

Third, whilst exploring the challenges facing women in STEM jobs, primary attention has been given to organizations as the unit of analysis, consequently we know little about how the larger societal and national context may shape the career experiences

of STEM women. The importance of context is being increasingly acknowledged in career scholarship with a push to move away from the traditional focus on agency, and to incorporate context into our understanding of contemporary careers (see Afiouni & Karam, 2014; Cohen & Duberly, 2015; Briscoe, Hall, & Mayrhofer, 2011; Chudzikowski & Mayrhofer, 2011; Gunz, Mayrhofer, & Tolbert, 2011; Tams & Arthur, 2007). This study is a response to the call and extend current career literature by *contextualizing* careers (Young & Collin, 2004) in relation to the larger social context in which individuals are embedded (i.e., the Lebanese context in this study). This study takes into account the dynamic ways in which the women construct and enact their careers (Bierema, 1998; Cohen & Mallon, 2001; McDonald & Hite, 1998) and their subsequent experiences.

Fourth, by conducting research within an understudied Lebanese context, this study will provide international perspectives while offering meaning that are local and culture specific (Berry, 1997). Through contextualizing the research in the Lebanese context, I am able to identify the interplay of multiple factors influencing women's career experiences in STEM and broaden our understanding of careers beyond established western career concepts (Tams & Arthur, 2007), and further expand the scope of career scholarship (Corley & Gioia, 2011).

The last significance of this study lies in the study sample under study. The existing literature on the career experiences of women in STEM fields has developed mostly in Canada (e.g. Miller, 2004; Ranson, 2003; Orser, Riding, & Stanley, 2012), USA (e.g. Cardador, 2017; Glass et al., 2013; San Miguel & Kim, 2015), the UK (e.g.

Herman, 2015; Watts, 2009), Europe (Hass et al., 2016; Herman et al., 2013) and China (Aaltio & Huang, 2007). Far fewer studies have targeted the career experiences of women in STEM in developing countries. Conducting a study in the context of Lebanon will further expand the career literature and focus on an understudied professional population.

Boundary of the Study

This study is situated within the five boundaries:

1. This study focuses on the Lebanese context.
2. This study explores STEM careers.
3. This study targets women professionals working in STEM fields.
4. This study seeks to understand the motivation behind the women pursuing their line of work.
5. This study seeks to understand what impacts the career experiences of women in STEM in Lebanon.

Since the study is conducted within these boundaries, generalization of the findings should be done with caution. In turn, the aim of this study is to gather in depth insight about the career experiences of women in STEM fields in Lebanon.

Definition of Terms

In this section, I provide definitions of key terms used in this study; (a) career, (b) STEM, (c) women, and (d) Lebanon. These definitions were selected in reference to the literature and the study context.

Career: Several definitions and conceptualizations of career have been documented in the literature. In this study, careers are defined as "the evolving sequence of a person's work experiences over time" (Arthur & Rousseau, 1989, p. 8).

STEM: STEM refers to Science, Technology, Engineering and Math.

Women Professional: Women in full-time employment status.

Lebanon: A country in the Middle East region that is geographically bounded by Syria, the Occupied Palestinian territories, and the Mediterranean Sea.

Summary

This dissertation is comprised of five chapters. In Chapter I, I give an overview of the dissertation topic, the guiding theoretical framing, the purpose and research questions, the significance, the boundary of the study, and definitions of key terms used. In Chapter II, I go in depth and give a detailed review of various career development theories and discuss in particular the career construction theory (Savickas, 2002) that fits most with the study's purpose. In Chapter II, I also review the empirical literature on the career experiences of women in STEM. In Chapter III, I describe the methodology and methods that I adopted for this study. I offer a rationale for a qualitative research design, followed by a description of the study's conext and the methods for participant selection, data collection and data analysis. In Chapter IV, I present major findings of the study in response to the three research questions. Finally, in Chapter V, I interpret the study's findings and discuss implications for theory, research, and practice.

CHAPTER II

LITERATURE REVIEW

This chapter reviews the theoretical and empirical literature informing this dissertation study and describes the context within which this study will be conducted. The first section gives an overview about the Lebanese context. The second section presents an overview of career development theories as the theoretical foundation for this study. Finally, the last section reviews the empirical research on women in STEM careers presented in personal characteristics, influencers, challenges, and coping strategies. This chapter concludes by identifying gaps in the reviewed literature. Figure 1gives a visual representation of the various components included in this chapter.

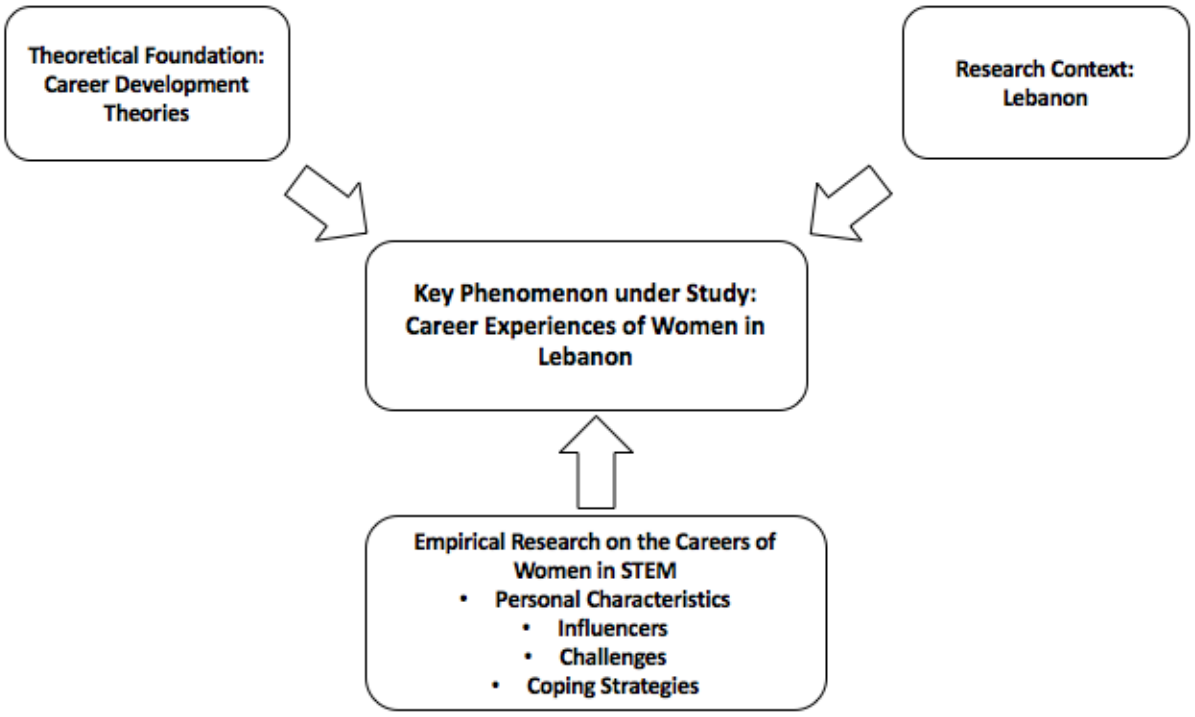


Figure 1. Components of Chapter II

Context of the Study

This study was conducted in Lebanon. Lebanon is a small country in the Middle East with peculiar macro-level indicators that make the investigation of employment and career related behaviors particularly interesting. Education rates in Lebanon are notably high, and women now surpass men in university enrollment with a Secondary School Net enrollment rate of 67.6 compared to males' 67.4 (UNESCO Institute for Statistics, as cited by United Nations ESCWA, 2016). This is also true for the Middle East and North Africa (MENA) region in general, as it has closed 93% of its gender gap along the educational attainment sub-index of the global gender gap index (WEF, 2015), making considerable improvement since 2006 (<90%).

In terms of the economic participation and opportunity sub-index, however, not much progress has been made since 2006, with only 1% (from 39% to 40%) improvement over the last ten years (WEF, 2015) in the MENA region. Lebanon is no exception, with a persisting economic participation and opportunity gap of 40% over the last 10 years (WEF, 2015). The Global Gender Gap Index (GGGI) is significant (0.59 in Lebanon), and ranks 13th among Arab countries, and 138th globally - out of the 145 countries sampled by the World Economic Forum (2015). As the GGGI measures existing gaps between men and women in the domains of health, education, economy and politics, Lebanon's score suggests high levels of gender inequality in those domains.

Moreover, the Social Institutions and Gender Index (SIGI) also indicates high levels of discrimination for Lebanon, with an index of 0.29, ranking 4th among other Arab countries, and 83rd globally (OECD, 2014). The SIGI takes into consideration

discriminatory family code, restricted physical integrity, son bias, restricted resources and assets, and civil liberties. These indices thus suggest that Lebanon is still lagging behind in its slow but steady path to closing the economic gender gap. These characteristics provide a fertile context to explore career experience of Lebanese individuals, especially women.

Further, from a legislative perspective, Lebanese women still face many discriminatory labor laws. Articles 26 to 30 of the Lebanese Labor Code specifically address the employment of women. For example, Article 27 restricts the employment of children, adolescents, and women in, amongst others, the production of alcohol and all other alcoholic drinks, cutting up animal carcasses, and work involving electric accumulators and driving engines. The same article also prohibits heavy work that involves chemical elements (for example, mineral products, glass, metal, lead, asphalt, and some fertilizers), and underground work. The fact that they apply to both women and children indicates that women, although having reached adulthood, are regarded as juveniles.

Given this context, Lebanon is a country characterized by salient socio-cultural, political, legal and religious ideologies that have had severe impact on multiple levels: the society, work environment, and the family. For example, in terms of socio-cultural ideologies influencing the careers of women, patriarchy is salient and manifested at multiple levels (Afiouni & Karam, 2014; Karam & Afiouni, 2017). Further, at the organizational level, the inequities and perceptible differences in the career experiences of women versus men are stark and well documented (Afiouni, 2014; Karam & Afiouni,

2017; Tlaiss & Kauser, 2010). Based on this, the career experiences of women are influenced by the complexities of the Lebanese context and must be studied in light of the contextual realities that exist. In turn, allowing me to better capture the intricacies of such a context, and understand how it is related to the career experiences of women in STEM fields.

Theoretical Foundation: Career Development Theories

The phenomenon of Lebanese women's careers in STEM fields in this study is informed by career development theories. In this section, I will review the various career development theories that have been discussed in the literature and that relate to my study. I will then specifically focus on career construction theory (Savickas, 2002) that appears to be the most relevant to the phenomenon in this study. Before that, I will give an overview of the changing nature of career to highlight the transformation of the career concept.

Changing Nature of Career

The career literature has traditionally focused on the organizational level of analysis and considered careers as the process by which organizations renew themselves, with a view of careers as structures and routes (Evetts, 1992; Gunz, 1989). A "career" is thus seen as the succession of posts and positions through which employees have moved during their working lives. (Evetts, 1992).

Recently, the shifts toward the contemporary career models have moved the level of analysis to individuals, and led to the conceptualization of career in more subjective terms (Baruch, 2006; Hall & Chandler, 2005). According to this view, a career is seen as

the series of choices and negotiation of constraints made by people between different opportunities presented to them (Evetts, 1992; Gunz, 1989). Further contributions to the career literature have highlighted the increasingly dynamic, subjective character of careers where the individual, not the organization, is in control of his or her career management and development. For example, according to the protean career (Baruch, 2008; Briscoe et al., 2006; Cabrera, 2009; Hall, 2004) an individual is able to rearrange and repackage his or her knowledge, skills, and abilities to meet the demands of a changing workplace as well as his or her need for self-fulfillment (Valcour & Ladge, 2008).

Within the boundaryless career (Arthur & Rousseau, 1996; Arthur, Khapova & Wilderom, 2005; Sullivan & Arthur, 2006) individuals look for career opportunities beyond the boundary of a single employer. An individual is independent rather than dependent on a traditional organizational career arrangement. The kaleidoscope career (Cabrera, 2007; Mainiero & Sullivan, 2005; Sullivan & Mainiero, 2008) describes how individuals shift their career path according to their changing life priorities over time and consists of three main parameters according to which career focus shifts throughout one's life cycles. These parameters are Authenticity, Balance, and Challenge. The post-corporate career (Peiperl & Baruch, 1997) refers to careers that take place outside large organizations, whereby individuals enact a multitude of alternative career options, including employment with smaller, more agile firms; self-employment; working in small project teams; or other ad hoc arrangements.

Overview of Career Development Theories

Career Development (CD) theories emerged starting in the 1950s and CD theory development continues today (Chen, 1998). In exploring relevant CD theories for my study, I identified three theories that I will discuss in depth in this section. These three theories are: Social Cognitive Career Theory, Super's Lifespan Theory, and Career Construction Theory. Among the above-mentioned career development theories, career construction theory better fits the phenomenon I am interested in exploring. Therefore, I will explain career construction theory in more depth and highlight how this theory relates to my study. I will also review the empirical studies that have used the career construction theory as their guiding framework.

Social Cognitive Career Theories (SCCT). As described by Lent, Brown and Hackett (2000, 2002), SCCT is anchored in Bandura's (1989) general social cognitive theory, and ''focuses on several cognitive-person variables (e.g., self-efficacy, outcome expectations, and goals), and on how these variables interact with other aspects of the person and his or her environment (e.g., gender, ethnicity, social supports, and barriers) to help shape the course of career development'' (Lent et al., 2000, p. 36). The cognitive-person variables enable people to exercise agency (i.e., person control) within their own career development (Lent et al., 2002). The key determinant for individuals to exercise control in this context is their correct beliefs about their self-capacity to successfully implement the life career developmental tasks, or career self-efficacy (Betz, 2001).

Another distinctive feature of SCCT that may be very relevant to women's career needs and experiences is its attention to the social and environmental contexts in which human agency and self-efficacy function. For example, SCCT includes consideration of the physical attributes of the person (e.g., sex and race), features of the environment, and particular learning experiences, which influence career interests and choice behavior (Lent et al., 2000). These contextual variables encompass the unique barriers that women encounter in their career development, such as discrimination, sexual harassment, and various double binds (Shapiro, Ingols & Blake-Beard, 2008). This recognition of and emphasis on the contextual factors in individuals' career development appears to be relevant because, as discussed earlier, women's career development is especially affected and complicated by a range of dynamic interactions between social, societal, personal, and other related contexts.

Super's Lifespan Theory. Super's (1980) Lifespan Theory explains that career choice and development is a process of constructing and actualizing one's self-concept. In specific, three salient constructs in Super's Life-span Theory can apply to women's career development experiences. The first construct includes self-concept life roles and the proposal that people recycle through their life career developmental stages of growth, exploration, establishment, maintenance, and disengagement. Super's theory asserts that a person's self-concept, which changes over time, is a combination of biological characteristics, social roles played, and evaluations of how others react to the person (Super, 1990). According to Super, the selection of an occupation is an implementation of one's self-concept (Super, 1990). Secondly, Super's theory recognizes that people

play various roles throughout their life spans, for example, caregiver, worker, citizen, student, and child. As women bear the bulk of the responsibility for child and home care alongside seeking a career, recognition of these various overlapping roles, particularly in both the public and private spheres, is essential when considering the career development of women (Metcalfe, 2011; Rutledge et al., 2011). Finally, by proposing that people recycle throughout the various development stages, Super's theory accommodates women's increased interruptions in employment, due to reasons such as family responsibilities and employment inequities.

Career Construction Theory. Savickas (2005) considers an individual person as an active agent and addresses how the individual elicits meaning from his or her life experiences. The process of career construction is essentially that of developing and implementing vocational self-concepts in work roles. This theory explains vocational behavior by using (a) career personality, (b) career adaptability, and (c) life themes.

Overview of Career Construction Theory

The theory of career construction advanced by Savickas (2002) updates and advances Super's (1957) seminal theory of vocational development for use in a multicultural society and global economy. Specifically, the theory addresses "how the career world is made through personal constructivism and social constructionism" (Savickas, 2002, p. 43). In career construction theory, career development is driven by an adaptation to the environment, rather than of an individual's inner maturation. Individuals thus construct their careers by imposing meaning on their vocational behavior and occupational experiences. Savicaks (2002) defines a career from a

subjective perspective and is mainly concerned not with the sum of work experiences that an individual hold but in the patterning of these experiences that allow for a holistic and meaningful understanding of the career story. Thus, a career is "a subjective construction that imposes meaning on memories, present experiences, and future aspirations by weaving them into a life theme that patterns that individuals' work life" (Savickas, 2004, p. 43).

Through career stories, individuals narrate their work experiences and highlight particular examples that shed light on their active process of meaning making. From this perspective, the career construction theory focuses on how an individual develops the *what, how,* and *why* of making a career decision by using a narrative approach (Glavin & Berger, 2012). Further, career construction theory addresses three components regarding understanding career development over the life span: (a) the psychology of individual differences, (b) the psychology of development, and (c) the psychology of motivation (Savickas, 2005; Savickas, 2011). The psychology of individual differences relates to the content of vocational personality (i.e., what different people prefer to do). The psychology of development relates to the process of adaptation (i.e., how individuals deal with vocational tasks and work related challenges). The psychology of motivation relates to why a certain career choice is made and which life themes make meanings and lead to certain vocational behaviors (i.e., calling). Savickas (2005) suggests that these three perspectives are central components when constructing an individual's career. These three perspectives are further detailed below.

Vocational Personality. Vocational personality refers to an individual's career-related characteristics such as interests, needs, skills, abilities, and values (Savickas, 2005). It emphasizes the occupational content of career, the intrinsic influences on career development, and the context in which individuals live or derive career influences (Patton & McMahon, 2006). Hence, vocational personality deals with *what* careers individuals construct.

Career Adaptability. Career adaptability emphasizes the coping process through which individuals connect to their communities and construct their careers. In considering adaptation, Savickas (2005) takes the perspective of both the self and society. Further, individuals use four global adaptive dimensions to manage critical tasks, transitions, and traumas as they construct their careers: (a) career concern, (b) career control, (c) career curiosity, and (d) career confidence (Savickas, 2005). That is, adaptive individuals are more likely to feel concerned about their vocational future, have a sense of control over their career, proactively explore possibilities, and have greater levels of confidence on pursuing their career (Savickas, 2005). Hence, career adaptability deals with *how* an individual constructs a career.

Life Themes. Life themes refer to individuals' career stories or narratives about tasks, transitions and traumas revealing the *why* of vocational behavior and the private meaning that guides career choices (Savickas, 2005). Individuals use life themes to make meaningful choices and adjustments to work roles. Life themes also provide contexts for the meaning of a career and the dynamics of its construction. By combining and

organizing life themes, career patterns emerge and become a fundamental way for individuals to see themselves and what is important to them.

Career Construction Theory in Relation to this Study

To move towards the goal of exploring the career experiences of women in STEM fields in Lebanon, career construction theory is relevant for this study for four reasons. First, career construction theory explains the interpretive and interpersonal processes through which an individual imposes meaning and direction on their vocational behavior. As such, this theory aligns with my interpretivist qualitative research approach that I intend to adopt as my epistemological paradigm.

Second, career construction theory is sensitive to the context in which the individual's career unfolds, that is, the theory takes the role of context and environment in the shaping of individual's careers. The theory was specifically developed in order to shift from an organismic worldview of vocational development to a contextualistic view (Douglas & Duffy, 2015). Savickas (2005) asserted that human development was driven by continuous adaptation to a social environment with the goal of person-environment integration. With respect to my study, this theory will allow for a contextualized understanding of the career experience of Lebanese women in STEM fields and may explain how these women construct and make meaning of their careers vis-à-vis the Lebanese context. As such, it allows for an individualistic understanding of career that incorporates the context in which the careers are lived out.

Third, the career construction theory provides a framework to use narrative to capture an individual's subjective life experience as story. As such, the women in this

study, through narratives will be able to share who they are and what matters to them with respect to their careers. As they share their stories and engage in reflective construction of their careers, I will be able to capture the totality of their experiences. Further, through narration, the women in this study may reveal how they have adapted, are adapting and hope to adapt to career-related choices.

Finally, career construction theory, with its focus on the subjectivity of the individual's career allows for its application in the non-western context. This will allow the women participants to construct their own meaning about their careers whilst regarding both their individual and environment characteristics. The career construction theory as discussed above is thus culturally sensitive and context specific.

Empirical Research on Career Construction Theory

Career construction comprises both a theory of vocational behavior (Savickas, 2002, 2015) and a system of career counseling (Savickas, 2011, 2015). Findings based on career construction theory have provided a foundation for career development practice, and have provided professional career counselors with a wealth of knowledge about how to help their clients make vocational choices and construct successful and satisfying work lives. However, recent studies grounded within career construction theory (Cardoso et al., 2014; Guan et al., 2017) have primarily focused on the measurement and correlation of career adaptability, but have not sufficiently addressed other key components of the theory. Thus, within the career construction literature, empirical studies mainly address career construction theory from a counseling perspective and tend to focus on the career adaptability aspect of the theory. These

studies (Hartung & Vess, 2016; Xie et al., 2016) in turn translate the career construction theory to practice in the form of a counseling model and methods for helping people construct and adapt to their careers. For example, two recent studies have focused on career adaptability to explore how imposter phenomena are related to adaptive readiness, career adaptability resources, and adapting responses, namely, career planning, career decision-making difficulties, career exploration, and occupational self-efficacy (e.g. Hartung & Vess, 2016). Guo et al., (2014) using career adaptability as a major individual predictor of professional competence, examined the individual and environmental predictors of professional competence among social work students in China. The authors found that both career concern and career curiosity predicted social work students' professional competence, with these relations being mediated by the calling in social work.

Further, in a study consisting of university students and full-time workers, Tolentino and her colleagues (2013) conceptualized adaptive readiness in terms of a dual-process coping model (i.e., assimilative and accommodative tendencies). They reported that both assimilative and accommodative tendencies were positively associated with career adaptability and adaptation outcomes (e.g. career satisfaction and career progression). When investigating career adaptability using Savickas' (2002) model as a guiding framework, researchers usually assessed the proposed dimensions with different attitudinal or behavioral scales, measuring career planning (concern), career decidedness (control), career exploration (curiosity), and career self-efficacy beliefs (confidence) (e.g. Balin & Hirschi, 2010; Creed et al., 2009; Creed et al., 2011; Hirschi, 2009; Koen

et al., 2010). Other researchers just used a subset of such measures to represent the construct of adaptability: for example, career decision self-efficacy and career commitment (Duffy & Blustein, 2005), or career exploration and career planning (Hirschi, 2010b; Klehe et al., 2011; Zikic & Klehe, 2006). These measurement approaches implement traditional notions of psychological career maturity (Crites, 1961; Super et al., 1981) yet also coincide with the more modern definition of psychosocial adaptability as a set of behaviors and attitudes (Savickas, 2002).

Empirical Research on Women's Careers in STEM Fields

In this section, I will give an overview about how the career experiences of women in STEM fields have been documented in the literature.

Searching and Organizing the Empirical Literature

In this section, I review the literature on careers of women in STEM fields, drawing mainly from searching three bodies of knowledge (STEM, Women, Careers). Specifically, I focus on the empirical studied that fall at the intersection of these three bodies in order to identify the relevant articles that focus on the career experiences of women in STEM fields.

To identify related articles for this review, I searched two databases (ISI Web of Knowledge and Scopus) since they encompass all the journals indexed in SSCI as well as all the leading journals in the management field. I searched abstracts of peer-reviewed articles using variations and Boolean connection of women, STEM and career terms. Specifically, I used the following keywords: "women," "woman," "female," "gender", "science" "technology," "engineering," "math," or "STEM,", "career" or "career

development", "job", "employment" or "vocation" in the management, psychology applied and business categories in both databases. The initial search yielded 165 articles. RefWorks and an Excel table were used as data management tools (Callahan, 2010) to track, select and organize the selected literature. After removing duplicates, 165 texts remained in the data sample.

Article Selection

With the study purpose as a guide, I established a predetermined literature selection criteria (Torraco, 2005) to identify the most relevant texts from the data sample. For my research, the study had to meet the following three criteria to be included in the review:

a. had to be published in a peer-reviewed, English language journal,
b. had to empirically examine the career experiences of women in STEM fields in order to fully understand their intricate experiences as discussed in the literature, and
c. be published between 2000 and 2017 in order to remain abreast of the latest research.

I first conducted a review of the abstracts (Torraco, 2005) of the identified 165 articles and 94 articles did not meet the selection criteria. I then conducted a second staged review and expanded from reading the abstracts to reading the introduction, findings and discussion sections of the remaining 71 articles. An additional 43 articles were excluded and only 28 articles met the selection criteria and were included in this review. Studies were excluded if they discussed (a) the educational pipeline of STEM

majors, (b) the intentions of students to pursue a STEM major and/or career and (c) individual interest in STEM. An overview of the final 28 selected literature is presented next followed by the findings of a thematic analysis.

Overview of the Studies' Characteristics

The 28 reviewed studies were published in 15 different journals, representing various management disciplines. More precisely, eight articles were found in the *Gender, Work, and Organization* journal while three publications were published in career-focused journals (such as *Career Development International* and *Journal of Career Development).* Human Resource journals also included relevant publications, with 2 articles published in *Human Resource Management* and in *Human Resource Management Journal* as well as 4 articles in the *Journal of Vocational Behavior*. The rest of the articles (n=11) were published in various journals such as *Gender & Society* (2), *Sex roles* (3), *International Journal of Entrepreneurial Behavior & Research* (1), *Entrepreneurship and Regional Development* (1), *Journal of Organizational Change Management* (1), *Organization Science* (1), *Social Forces* (1), and *Work Employment and Society* (1).

In terms of research methodologies, 19 of the 28 articles adopted a qualitative design, two of which were grounded theory studies, another 2 used an ethnographic methodology, and one publication was a phenomenological study. The rest of the publications were quantitative studies (n=6) and another 3 articles used the mixed methods research approach. For data collection, survey and interviewing were the most

popular methods used and the studies were mostly conducted on sample population in Canada, China, USA, the United Kingdom, and various European countries.

Themes Identification

I read the final 28 articles in their entirety in order to grasp an understanding of the content and to employ a thematic analysis method for theme identification. Cho and Lee (2014) defined a thematic analysis as "a method for systematically describing the meaning of qualitative material… focuse[d] on extracting categories from the data" (p. 50). The thematic analysis for this review consisted of coding content with an understanding of the research question using emic codes for emergent ideas, key words, or phrases (Creswell, 2013). While reading, I started open coding the articles based on a phrase or word in the text. This process led to an initial list of codes generated from all of the articles. Next, I started grouping like-codes with similar meanings or understandings in order to create a category (Cho & Lee, 2014). For example, the codes *discrimination, gendered organization,* and *changing culture* were grouped together to form the category *Challenges.* Thematic analysis, as Saldana (2013), noted is a highly subjective process as it draws on "tacit and intuitive senses to determine which data 'look alike'" (p. 9). I summarized the articles in a review matrix and codded each one for context, theory used, research design, and findings (See Table 1).

The review of the literature generated four primary themes: (a) personal characteristics, (b) influencers, (c) challenges, and (d) coping strategies. themes are discussed in the following section.

Personal Characteristics

In this section, I will discuss the personal characteristics that influence the career experiences of women in STEM fields including motivation, self-efficacy, and attitude.

Motivation. Proving herself self was one of the women's motivators whilst working in any of the STEM fields. The women would go to great length to prove that they are capable and competent engineers (Adya, 2008; Hatmaker, 2013) by building their professional identity and amplifying their technical abilities. The motivation behind proving themselves was not solely to progress the women's careers, but more to be taken seriously as engineers by their male counterparts (Hatmaker, 2013).

Goal orientation and/or purpose driven was another motivator that the women discussed and considered to be an important factor in their career advancement in science and engineering fields (San Miguel & Kim, 2015). By setting a clear path and diligently pursuing success, Latina scientists and engineers were motivated to work hard despite the various limitations that they faced in order to achieve their career goals (San Miguel & Kim, 2015).

Self-efficacy. In the Chinese context, women identified their personal competence and talent as being more important than the *Guanxi* network (Aaltio & Huang, 2007). Further, these women approached their work in information technology with a high orientation towards competition and personal development all intertwined with a career focused mindset (Aaltio & Huang, 2007; Crump et al., 2007). Along the same line, Buse et al. (2013) identified distinct individual factors that separated the persistent women engineers from those that opted out of the engineering workforce. For

example, self-efficacy was expressed on behalf of the women in relation to finding new assignments, dealing with difficult situations, or tackling tough problems (Buse et al., 2013). Here, women discussed how their capabilities and skills allowed to build successful relationships with their colleagues and to affect positive change at the workplace (Buse et al., 2013).

Attitude. The third personal characteristic is the women's attitude while working in any of the STEM fields. In Aaltio and Huang's (2007) paper, the women participants discussed a "can-do" attitude, and their love for their jobs. Latina scientists and engineers expressed that exercising passion and believing in the work that one is doing will ultimately facilitate career progression in STEM (San Miguel & Kim, 2015). Further, women working in the information technology field in the US discussed that only by portraying confidence and the right attitude will you be able to progress in your career (Orser et al., 2012).

Influencers

Through my analysis, I identified three major influencers that have impacted women's career experience in STEM: (a) influence of parents, (b) influence of male peers, and (c) influence of human resources practices.

Influence of parents. Parents, and especially the father, had a major influence on the careers of women in STEM. The father was considered an important role model and promoter of some of the women's interest in STEM (Hass et al., 2016). For example, as an academic engineer, one of the fathers acted as a role model in his family and motivated his daughter to do something "different", something "new" and pursue a

career in STEM (Hass et al., 2016). Further, with the help from their fathers working in academia, British women gained access to the male world of science. The fathers helped introduce their daughters to relevant people and raised their awareness of what they can accomplish with a science career (Duberley & Cohen, 2010). For women in Canada, the historical contributions of their fathers to the Oil and Gas industry as well as their mothers' work in the field gave them an insider look and excited them to pursue an engineering career (Miller, 2004). As for South Asian women, choosing a career in information technology was relatively forced by the parents who mostly worked and had a technology or engineering backgrounds (Adya, 2008).

Influence of male peers. Recounting their career development and promotion path, European women scientists stressed the impact of senior males in their integration within the scientific system and research groups (Hass et al., 2016). The support of an established male colleague and his larger social network contributed to the women's career advancement in science as well as for securing competitive jobs and grants (Hass et al., 2016). Nonetheless, other women were negatively influenced by the lack of support from their male peers. One engineer recalled how her supervisor gradually pulled back his support and networks and played an adverse role in her career development (Hass et al., 2016). In a similar manner, male peers openly expressed their opinion that American women would never make it in information technology careers and posed to hinder their career advancement (Adya, 2008).

Influence of human resources practices. Human resources practices, in the form of developmental opportunities, influenced women engineers' career experience

and subsequent turn-over intentions (Singh et al., 2013). The availability of developmental opportunities such as training and professional development programs were found to be positively related to American women engineers' self-efficacy and success on the job (Singh et al., 2013). In addition, long-tenured women engineers emphasized the importance of continuous learning opportunities for their persistence in their careers (Buse et al., 2013). Opportunity to work on new technologies, projects or products ranked high for the US women engineers (Buse et al., 2013). Nonetheless, women working in the information technology fields in the U.S. cited the challenge of improper implementation of human resources practices and its deterring effect on their career progression and access to social networks (Orser et al., 2012).

Challenges

Challenges on various fronts were identified in the literature. I will discuss four challenges that women working in STEM fields have faced the most. They are: (a) gendered organizational culture, (b) gender-role stereotyping, (c) work-life balance, and (e) lack of mentors.

Gendered organizational culture. At the organizational level, women reported experiencing gender based discrimination that was embedded within the larger organizational culture. In Cardador's study (2017) in the US, women engineers identified both explicit and implicit gender sorting mechanisms that their organizations used to move them away from the technical path and more into the management path. Women were seen to be more suited for managerial roles and were encouraged to take on roles that emphasized the "people side" of engineering (Cardador, 2017, p. 604).

Gendered career patterns were thus reinforced by organizational members and structure with women noting that they might have left the engineering profession had they stayed in technical roles (Cardador, 2017). For women in academic science careers, science was seen as institutionally gendered and a predominantly male pursuit with prevalence of gendered opportunity structures within their universities (Duberley & Cohen, 2010). In their study, Settles et al. (2006) found a positive relationship between sexual harassment, gender discrimination and departmental climate, and women's overall attitude towards their employment in academic science positions in the US.

Gender-role stereotyping. The gendered career patterns discussed earlier served to validate the stereotypes about women engineers being less technically capable than their male counterparts and dispositionally suited for more feminine roles (Cardador, 2017). In addition, occupational roles and organizational practices in the information technology field in the US were stereotypically geared towards a male life style, characterized with long working hours and extensive travels (Orser et al., 2012). As a consequence, women were marginalized in their own profession and the assumption that their roles as mothers and wives preceded their professional role pervaded (Orser et al., 2012). In New Zealand, the information technology culture, as explained by women working in the field, has a deeply entrenched stereotypical image of a "geek" male who lacks communication and social skills (Crump et al., 2007, p. 364), making women feel isolated and a misfit. Further, stereotype notions were also hinted at through language (Ecklund et al., 2012). For example, women physicists identified gendered language

whilst interacting with their male colleagues as inherently masculine (Ecklund et al., 2012).

Work-life balance. Women working in STEM fields discussed the difficulties in managing the demands of work and home (Duberley & Cohen, 2010; Kameny et al., 2014). Work and family issues were identified as career barriers to women working in information technology (Orser et al., 2012), with challenges ranging from taking care of children and the elderly to dealing with the pressing demands of the job. In fact, in their study, Glass et al. (2013) found that family obligations deterred American women's commitment towards work in STEM and decreased their retention in their fields. On the other hand, American women engineers who persisted in their careers cited the understanding and empathetic support that they gained from their managers for balancing their family and work roles (Fouad et al., 2016).

Lack of mentors. Lack of mentoring and support was identified as a career barrier for women chemists in the US (Nolan et al., 2008). Even when mentors were available, American women engineers were encouraged to go into management positions instead of technical ones mainly because of their people and communication skills, without taking into consideration the women's career interests (Cardador, 2017). Further, through their reflection, female academic scientists noted how the lack of mentors and/or role models enticed some of them to switch their majors and subsequently their careers from physics to biology where they felt they would fit more and receive more guidance (Ecklund et al., 2012). In addition, Latina women scientists

highlighted the importance of peer/informal-mentoring as a positive factor in their career success and development (San Miguel & Kim, 2015).

Coping Strategies

In the previous section, I discussed the challenges that the women faced throughout their STEM careers. Women in turn adopted various strategies to cope with these challenges in order to advance in their careers. In this section, I discuss three strategies women in STEM employ to tackle the challenges they face in their workplace: (a) conforming, (b) impression management, and (c) confrontation.

Conforming strategies. Conforming strategies and/or assimilation strategies are characterized by conformity to existing organizational structures and an acceptance of the status quo by women in STEM careers (Herman et al., 2013; Orser et al., 2012; Powell et al., 2009). For example, European women in science, engineering and technology careers continued to conform to ideal male worker practices and values, and themselves refrained from challenging the traditional masculine image within their organization (Herman et al., 2013). U.S. based women engineers, on the other hand, used rationalization to cope with their organizational culture that imposed gendered expectations with regards to work (Hatmaker, 2013). Additionally, Canadian women engineers working in the oil and gas industry reported that their early acculturation to the engineering field has convinced them that only by conforming to traditional masculine behaviors and norms would they be able to succeed in their engineering careers (Miller, 2004).

Impression management strategies. Impression management strategies refer to women's attempts to refrain from engaging in feminine practices and displaying typical feminine behavior (Rhoton, 2011) when working in any of the STEM fields. In doing so, women exercise impression management by distancing themselves from portraying feminine characteristics within the work environment and focus on behaviors that align more with masculine norms (Miller, 2013; Rhoton, 2011; Watts, 2009). For example, to adapt to their organizational cultures, American women engineers purposefully chose to "dress down", "change the tone of their voice" or "pulling their hair back" in an attempt to persist in their jobs (Buse et al., 2013, p.144).

Further, women working in STEM exercised "professional socialization" (Rhoton, 2011, p.703) as a strategy that entails distancing themselves from women colleagues who display stereotypical femininity. From a career stand point, the suppression of feminine characteristics is seen as means to complying with the standard norms of any of the STEM occupation, allows the women to advance in their careers as well as better integrate in the masculine organizational culture (Cardador, 2017; Ranson, 2003). To be viewed as an engineer rather than a woman, female American engineers aimed to project a professional image of themselves by downplaying their gender role and being careful not to be too feminine (Hatmaker, 2013). They focused on being technically proficient in their work, building a professional reputation by successfully completing projects, and working harder than their male peers (Hatmaker, 2013).

Confrontation strategies. As a career coping strategy in STEM fields, women adopted various proactive strategies to challenge the image of the male ideal worker and

resisted conforming to organizational practices and norms (Herman et al., 2013). When U.S. women engineers experienced encounters that imposed gender expectations, they used blocking mechanisms to bring their professional identity back to the foreground of the interaction and to challenge the hegemonic masculine organizational culture (Hatmaker, 2013). Blocking was used by women to point out why they were being assigned to gendered tasks and to avoid being associated with them (Hatmaker, 2013). In the same vein, women engineer also actively challenged discriminatory situations and highlighted implicit gender bias practices at their American workplaces (Buse et al., 2013). In the UK, in an attempt to confront the masculine culture of the STEM fields, women in science and technology resorted to entrepreneurship strategies (Martin et al., 2015). These entrepreneurship strategies developed mainly from the women's interests and education as well as the temptation of greater opportunities as an entrepreneur (Martin et al., 2015). Nonetheless, women entrepreneurs in STEM fields acknowledged that assumptions about how they were expected to operate and perform in their business was highly gendered (Martin et al., 2015). For example, a lot of the women discussed role-playing in different business situations in various STEM fields in order to meet the expectations of the larger entrepreneurial community. Figure 2 presents a summary of the empirical studies on the career experiences of women in STEM fields.

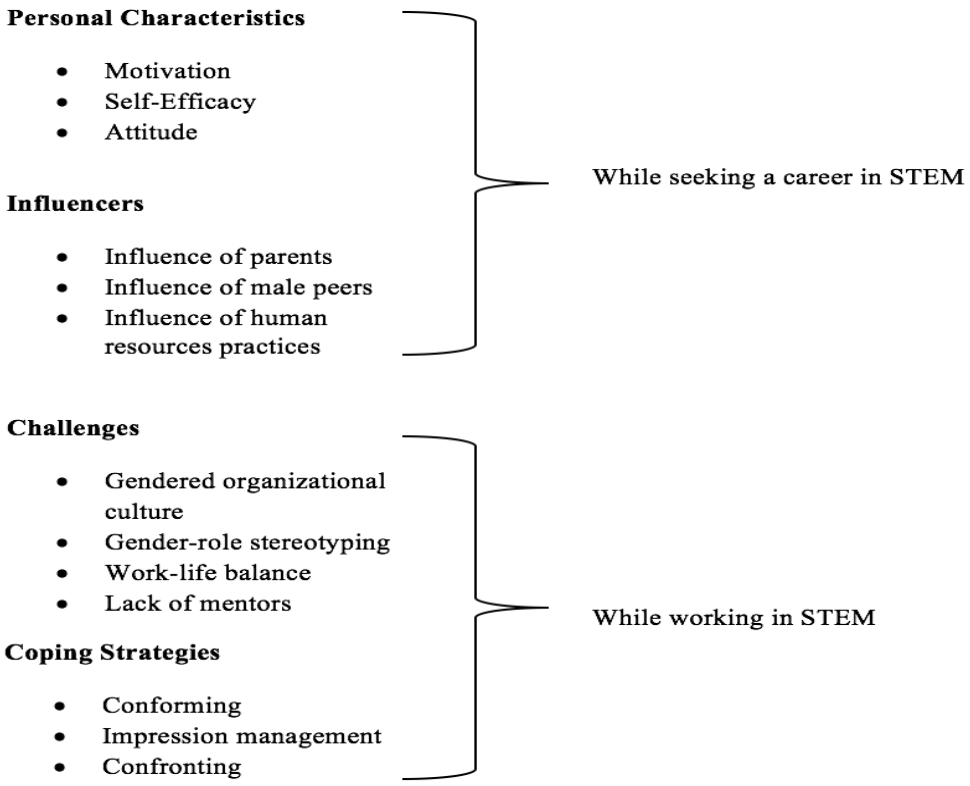


Figure 2. Empirical Literature on the Career Experiences of Women in STEM

In addition to the above-mentioned search, I conducted a targeted search in other databases to try to capture any publication that was carried out on the topic of women in STEM careers in Lebanon. I searched databases that publish articles in Arabic, English and French (the three recognized languages in Lebanon). To my expectations, I was only able to find few articles discussing women in STEM in Lebanon (all in the English language) and mainly addressing the topic from an educational perspective (e.g. Abouchedid & Kfouri, 2008; Baytiyeh, 2013; Baytiyeh & Naja, 2012; Khishfe & BouJaoude, 2016). Only Tlaiss (2013) explored the career experiences of women in the Lebanese healthcare sector. In her article, the women managers highlight the impact of

the macro, socio-cultural values and expectations in shaping their lives and careers (Tlaiss, 2013). The findings from Tlaiss (2013) also suggest that social expectations and discriminatory gender stereotypes define women's suitability for managerial roles within the Lebanese healthcare sector. The majority of the interviewees also described a discriminatory organizational culture that promotes gender stereotypes and prejudiced attitudes (Tlaiss, 2013).

Gaps in the Empirical Literature

From the above review of the literature, I have identified three gaps in our existing knowledge about the career experiences of women in STEM fields.

First, whilst exploring the challenges that women face in STEM jobs, the extant literature has focused on the organizational level of analysis at the expense of exploring the influence of the larger societal and national context on the career experiences of the women. Thus, this study will further contribute to the career literature through *contextualizing* careers (Young & Collin, 2004) in relation to the larger social context in which individuals are embedded (i.e. the Lebanese context in this study). Hence, taking into account the dynamic ways in which the women construct and enact their careers (Cohen & Mallon, 2001) and their subsequent experiences.

Second, the existing literature on the career experiences of women in STEM fields has developed mostly in Canada (e.g. Miller, 2004; Ranson, 2003; Orser et al., 2012), USA (e.g. Cardador, 2017; Glass et al., 2013; San Miguel & Kim, 2015), the UK (e.g. Herman, 2015; Watts, 2009), Europe (Hass et al., 2016; Herman et al., 2013) and China (Aaltio & Huang, 2007). Far fewer studies have targeted the career experiences of

women in STEM in developing countries. Conducting a study in the context of Lebanon will further expand the career literature and focus on an understudied professional population. The career experiences of women in STEM might differ greatly in developing countries and is worth exploring in order to devise context specific HR policies that will benefit HR practitioners and managers in that context.

Third, the majority of the articles in this review studied women's careers in STEM from a gender and feminist theoretical lens. Only few articles approached the topic from a careers perspective (e.g. Buse et al., 2013; Nolan et al., 2008) and mainly employing a social cognitive career theory. Considering the importance of career development in HRD (McLagan, 1989), research that leverages the use of career theories might expand our perspective on the career experiences of women in STEM.

Summary

In this chapter, I gave an overview of the Lebanese context in which this study is situated. Then, I reviewed the existing career development theories with a specific focus on career construction theory as one potential theory informing my understanding of the career experiences of women in STEM in Lebanon. Finally, I reviewed empirical studies on careers of women in STEM and identified three gaps in the existing knowledge base.

Table 1.

Literature Review Matrix

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
Haas, Koeszegi & Zedlacher (2016)	Breaking Patterns? How Female Scientists Negotiate their Token Role in their Life Stories	Europe	Token Theory	How female scientists construct and negotiate their professional identity in a highly-gendered work environment?	Qualitative (Interviews)	The paper presents two key cases which exemplify two alternative coping strategies: the women either use a similarity strategy, relying on full assimilation to the masculine norms in SET, or a difference strategy, highlighting their otherness and their struggle for equality. The in-depth analysis reveals that both strategies cannot 'break patterns', but instead leave the dominance of masculine norms in SET unchallenged.
Buse et al., (2013)	Why they stay: women persisting in	USA	Social Cognitive Career Theory	The study aims to identify individual and contextual factors that distinguish women who persist in	Qualitative (Grounded Theory, Interviews)	The findings show that women who persist in an engineering career differ from those opting out of engineering due to the following individual factors: high levels of self-efficacy related to engineering

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
	US engineering careers			engineering careers in the US. What factors explain career persistence of women engineers in industry in the USA?		and their work-life balance, identity as an engineer expressed in both work and life situations, the ability to adapt to work culture and experiences, an orientation towards others in work environments and engagement in work that yields purpose and fulfillment as an engineer. Women who persisted in engineering expressed their career choice as their own unlike out-opting engineers who were more likely to have discussed being pushed into an engineering career. Proximal contextual factors related to persistence consist of the work environment and the family environment including marital status and number of children.
Adya (2008)	Women at work:	USA	Social Construction +	The study explores cultural, social, and individual	Qualitative (Interviews)	Major Themes: Educational and Familial Orientation, Gender Stereotyping and Discrimination in

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
	Differences in IT career experiences and perceptions between South Asian and American women		Hofstede	factors that influence career perceptions and experiences of South Asian women in the U.S. IT work- force and compares it to those of American women.		the workplace, Coping with career genderization, Mentoring at work, professional challenges and turnover intentions, Long term career decisions,

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
Crump et al., (2007)	Does gender still matter? A study of the views of women in the ICT industry in New Zealand	New Zealand	Social Construction	The research had the following objectives: • to investigate the nature and extent of the masculine-gendered culture • to identify regional differences • to understand attitudinal differences between male and female ICT workers.	Qualitative (Interview + Focus Groups)	The results show that there are regional differences in organization type, job category and salaries, as well as in the perceptions of the women towards their environment. Most women did not actively seek to be employed in ICT — rather their entry was serendipitous. While they enjoyed working in the environment, there was an obvious gendering of the workforce with most technical positions being held by men and women working mainly in the softer side of ICT. The women perceived their gendered roles to be a highly important and an integral part of ICT and believed their salaries were equitable with their male colleagues.
San Miguel & Kim (2015)	Successful Latina Scientis	USA	Not mentioned	The study aimed to reveal the lived career mentoring experiences of	Qualitative (Phenomenology)	The in-depth interviews revealed that (a) it is important to have multiple mentors for Latinas' success; (b) various types of

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
	ts and Engineers: Their Lived Mentoring Experiences and Career Development			Latinas in science and engineering and to understand how selected Latina scientists and engineers achieved high-level positions.		mentoring can be effective in career development; (c) the support and encouragement of mentors is essential; and (d) mentoring relationships should be a mutual agreement. Findings also suggest that implementing formal and informal mentoring programs can encourage Latinas to pursue careers in science and engineering and have a positive influence on career success. The commonly shared characteristics and experiences that promote career success are trailblazer, mentoring types, networking, professional opportunities, support and encouragement, goal orientation, and passion and belief.
Duberly & Cohen (2010)	Gendering career capital:	UK	Not mentioned	In this article, the authors reflect on the increasingly popular concept of	Qualitative (Interviews)	This article examines the concept of career capital and shows how, whilst much of the boundaryless career literature seems to see capital

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
	An investigation of scientific careers			career capital, and apply the concept to data generated with a sample of women scientists.		as gender neutral, or at least does not explicitly deal with issues of gender, the concept can be better understood if attention is given to men's and women's differing experiences of career capital. In particular, our findings highlight the fact that what may be capital, or an asset for men may actually be an impediment for wo- men so that even within the same field there is no blueprint as to what capitals one should aim to accrue. Further, our findings suggest that women scientists feel that within the existing structures of science they do not have access to the same forms of career capital and that their career choices are curtailed as a result.
Servon & Visser (2011)	Progress hindere	USA	Not mentioned	The purpose of this article is to identify those factors that	Mixed Methods (Survey + Focus group)	Themes: Corporate culture (describe a workplace culture that is unsupportive to women and shaped

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
	d: the retention and advancement of women in science, engineering and technology careers			help to ensure and those which hinder the retention and advancement of women within the SET professions. More specifically, we seek to articulate those barriers related to professionalization that women face in being employed in and remaining employed in management positions within these fields. is professional legitimacy of women in SET careers perceived to be dependent		by norms of behavior and a process of professionalization in which women feel excluded. Our survey data found that women across the SET sectors report experiencing a variety of demeaning and predatory behaviors in the workplace including: experiencing sexual harassment, being viewed as less capable, a perceived bias in performance evaluation and receiving unwanted attention due to appearance), Isolation (fully one-third of women holding management positions in private sector SET jobs feel extremely isolated at work. We find that of our survey respondents, those women who reported feeling isolated were also 13 per cent more likely to report being unsatisfied with their job than those who did not feel isolated), Extreme jobs (Our survey

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
				upon a learned projection of masculine identity and behavior? And second, are the values and norms believed to underscore the SET field influencing how women advance in this sector?		data show that high level SET jobs are more extreme than the norm. We find that women in science, engineering and technology are more likely than women in other sectors to have 100-hour workweeks (8 per cent versus 3 per cent) – over twice the normal 40-hour workweek in the US. In addition, women in our survey were more likely to deal with constant customer demands (36 per cent vs. 26 per cent), and to work across multiple time zones (54 per cent versus 14 per cent). Research has shown that long workweeks, global responsibilities and around-the-clock demands make it difficult for both parents in a family to maintain ambitious careers. Such family/work dynamics are largely shaped by culture, socialization and economics and our research indicates that women in SET

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
						positions are also experiencing this.) Survival Strategies (The two primary strategies of those who do not leave are: (1) behaving like a man (impression management) and (2) finding a pocket of sanity (norms of professionalization).
Cardador (2017)	Promoted Up But Also Out? The Unintended Consequences of Increasing Women's Represe	USA	Role-congruity theory	While previous research has suggested that in male-dominated occupations moving women into managerial roles may help to address sex segregation, when is this not the case?	Qualitative (Grounded Theory Interviews)	Themes: Gendered career patterns, Organizational reinforcement of gendered career patterns, identity and professional consequences of gendered career patterns, inverted role hierarchy in engineering, Findings: The analysis highlights how organizations reinforce female engineers' movement into managerial roles and foster a form of intra-occupational sex segregation with unintended consequences for women. These consequences include fostering mixed identification with engineering, reinforcing stereotypes

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
	ntation in Managerial Roles in Engineering					about women's suitability for technical work, and increasing work–life balance tensions. The findings further suggest that an inverted role hierarchy in engineering may explain these gendered career patterns and their unintended consequences. By inverted role hierarchy I mean the valuing of technical over managerial roles.
Herman (2015)	Rebooting and Rerouting: Women's Articulations of Frayed Careers in	UK, Ireland	Frayed careers	How then can the experiences of women in SET professions potentially advance our understanding of frayed careers in the light of the unique position they occupy in highly gendered occupations?	Qualitative (Interviews)	Themes: Rebooting, Rerouting and Retreating: The 'Rebooting' narrative was characterized by a sense of continuity with a lifelong career identity, even if this included a history of short term contracts, intermittent jobs, periods of unemployment or family care. These continuity stories were told from the perspective of previous careers that were reignited and expressed aspirations for re-

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
	Science, Engineering and Technology Professions					inclusion into the professional SET community. A second narrative was that of career change or 'Rerouting', in which retraining and acquisition of new qualifications played a central role. In most cases these new careers had some connection to previous scientific and technical roles rather than taking a new direction altogether, but they were framed within a story of change and transition rather than as a return to a previous profession. Becoming a 'proper' scientist was considered to be out of their reach, often as a result of having become mothers, reiterating the difficulty of maintaining the two seemingly incompatible identities of scientist/engineer and woman/mother. Retreating, there were variations according to life stage and circumstances. For some,

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
						this had meant a return to full time caring role after initially having returned to a work role. In these stories, the logistics of combining care and paid work had been too difficult to sustain, leading to 'giving up' or 'opting out', but they had not turned to new careers as in the Re-routing narrative. For others without dependent children, their retreat had been due variously to redundancy, retirement, or in a couple of cases illness or disability that had prevented them from working. These narratives often included accounts that interlinked age with gender, illustrating not only that conventional linear career model was not applicable, but also that life-course stages are also mutable and cyclical.

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
Martin et al., (2015)	An unusual job for a woman? Female entrepreneurs in scientific, engineering and technology sectors	UK	Social Construction	The aim of the study was to explore the potentially "unusual" experiences of participants as SET entrepreneurs, given that both SET and entrepreneurship are statistically atypical for women.	Qualitative (Interviews, documents analysis)	By striving to become an "honorary man", participants felt they were effectively made part of the group of their SET counterparts and that assimilation in this male- dominated industry was possible by doing so. Gendered practice was seen to be embedded, as a given and inevitable part of life and participants adapted to male norms in SET and in business. However, despite claims that they did not suffer overt discrimination, their experiences were marked by high visibility and constant contrasts drawn between them as women and their male counterparts. Participants measured themselves by their SET knowledge and their business acumen and were proud when male business owners accepted them on that basis because that was how they wished to be judged.

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
Glass et al., (2013)	What's So Special about STEM? A Comparison of Women's Retention in STEM and Professional Occupations	USA	Not mentioned	Why, then, would women in STEM be even less likely to persist than women in other professional and managerial jobs?	Quantitative (Survey)	Results show that women in STEM occupations are significantly more likely to leave their occupational role than professional women, especially early in their career, while few women in either group leave jobs to exit the labor force. Family factors cannot account for the differential loss of STEM workers compared to other professional workers. Few differences in job characteristics emerge either, so these cannot account for the disproportionate loss of STEM workers. What does emerge is that investments and job rewards that generally stimulate commitment, such as advanced training and high job satisfaction, fail to build commitment among women in STEM.

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
Herman et al., (2013)	Women Scientists and Engineers in European Companies: Putting Motherhood under the Microscope	France, Netherlands, Italy	Not mentioned	The focus is on women working in three MNCs in their European headquarters (France, Italy and The Netherlands) and the impact of national context, especially regulation, policies and norms of combining employment and parenting. we wanted to understand what it means to be a mother in the context of SET MNCs and how this relates to workplace issues.	Qualitative (Interviews)	In all three organizations, there was a discourse of concern about the underrepresentation of women at senior levels, manifested in gender and diversity initiatives intended to address this issue. However, the evidence from our interviewees indicates that highly gendered systems leading to gendered 'opportunity structures' continue to be reinforced and reproduced, despite these well-intentioned policies. Our findings suggest that under- standing the processes of negotiating the trade-offs between ideal worker and ideal mother is crucial for understanding the experiences of SET women professionals in corporate contexts and for companies to bring about effective change. The leaky pipeline, often presented as a metaphor for women's lack of

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
						progression and issues of retention, masks the complexity of negotiating professional career and motherhood imperatives. Indeed, the conception of the leaky pipeline as solely a gender issue is misguided as it ignores processes of motherhood that supersede gender relations. Gendered assumptions about ideal scientists and engineers in these workplaces in terms of hegemonic masculinity, particularly professional commitment symbolized by constant availability and visibility and international mobility, reflect ideal worker norms, as in many other corporate contexts. Alongside this ideology in these three workplaces are strong stereotypes of motherhood, fundamentally juxtaposed with the ideal SET professional. Gender and motherhood are thus conflated in

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
						these organizations and it is SET professionals-as-mothers rather than just SET professionals- as-women that appear to be viewed as intrinsically problematic.
Ecklund et al., (2012)	Gender Segregation in Elite Academic Science	USA	Not mentioned	This article examines the reasons men and women academic scientists in two science disciplines (biology and physics) provide for gender segregation in academic science.	Mixed Methods (Survey + Interviews)	In the interviews, the rationales academic scientists use to explain the differing sex composition between biology and physics can be distilled into five narratives: natural differences, women actively discouraged from physics or discrimination, lack of role models, historical tradition of the discipline, and perceptions of the impact a career in the discipline will have on family choices. From our survey, we find that gender and stage of career—not discipline—are the most salient predictors of scientists' explanations for the difference in sex compositions of physics and biology.

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
Orser et al., (2012)	Perceived Career Challenges and Response Strategies of Women in the Advanced Technology Sector	Canada	Not mentioned	The purpose of the research was to examine perceived barriers to women's career advancement specific to advanced technology sectors (aerospace, defense, life sciences, engineering and information and communications technology (ICT).	Qualitative (Document analysis)	Personal-, firm- and industry-level barriers to career advancement were documented. The respondents attributed a high proportion of the challenges they encountered to gender. Respondents were most likely to resolve challenges through personal, or 'do-it-yourself', solutions. Few cited firm- or industry-related support structures. While mentoring was identified as a frequently used response strategy through which women address career challenges, the majority of firms in the advanced technology sector lack sufficient numbers of suitable women mentors. The lack of mentorship opportunities is particularly acute for women entrepreneurs. Respondents perceived that gender influenced self-efficacy (sense of credibility, perceived lack of credentials,

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
						confidence, know-how), performance expectations (e.g. different performance benchmarks), a lack of social capital, networking opportunities and a sense of belonging. While individual-level challenges included several non-gendered statements (such as concerns about geographic mobility, lack of technical expertise and obtaining business know-how), the frequency of responses suggests that respondents attributed gender (accurately or inaccurately) as a source of the personal problems they had encountered in their careers. Non-gendered barriers were noted with respect to lack of organizational leadership, challenges of handling firm growth, limited marketing knowledge and lack of training and resources. Industry related barriers,

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
						relationship management and competencies and work and family issues.
Rhoton (2011)	Distancing as a Gendered Barrier: Understanding Women Scientists' Gender practices	USA	Gender practices framework lens	This article examines how women scientists' gender practices contribute to gendered organizational structures that disadvantage women.	Qualitative (Interviews)	Themes: Distancing from women who de femininity, Distancing from Feminine Practices, Distancing by denying gender inequality. This study demonstrates that gendered structures and cultures also lead women scientists themselves to engage in practices that reproduce inequality. Women scientists' distancing practices not only support and reproduce gendered structures and cultures that contribute to gendered barriers for women in STEM disciplines but they also have implications for efforts to dismantle these barriers. Women's distancing practices reproduce gender inequalities in STEM fields by devaluing femininity and supporting

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
						occupational ideals that obscure structures, cultures and practices that frame women as outsiders and impede their success.
Watts (2009)	Leaders of men: women 'managing' in construction	UK	Feminist theoretical framework	This article draws on research into the career experiences of women civil engineers in the UK to critically discuss the possibilities for women to pursue a management pathway within construction.	Qualitative (Ethnography, Interviews)	The study highlights cultural issues of visibility and the presentism ethos of the sector as well as the material constraints of construction sites. Women are taking up senior management posts but only in very few numbers. Their success depends on assuming 'male' norms and in these roles, they straddle a marginal territory that is bordered by exclusion and resistance.
Powell et al., (2009)	How Women Engineers Do and Undo	UK	Gender practices	This paper reports on empirical research exploring women engineering students"	Qualitative (Interviews, Focus groups)	Themes: Gender performance (coping strategies): Acting like one of the boys, accepting gender discrimination, Achieving a reputation, Advantages over

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
	Gender: Consequences for Gender Equality			workplace experiences. The paper deconstructs women's experiences using theoretical arguments to investigate how gender gets done and undone in everyday organizational practice.		disadvantages, Adopting an "anti-woman" approach. Gender conflict.
Nolan et al., (2008)	Training and mentoring of chemists: A study of gender disparity	USA	Social Cognitive Career Theory	The current study aims to document the mentoring-related obstacles to development and retention with respect to women's advancement in the field of chemistry.	Quantitative (Survey)	Several patterns emerged in our data that suggested that women perceived more barriers related to a lack of social support and mentoring than men did. Specifically, men were more likely than women to report having learned about research experiences from a professor, whereas women were more likely than men to report learning about

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
						research experiences through other avenues. In addition, men were more likely than women to report having received help from an undergraduate professor when choosing a graduate school. Conversely, women were more likely than men to report relying on themselves or on "no one" to make their choices. Second, we found support for our hypothesis that men would report more positive graduate school experiences than women with respect to their dissertation advisors. Third, we found support for our hypothesis that men are more likely than women to report receiving mentoring from those other than their dissertation advisors. Fourth, our hypothesis that men would report better post-doctoral mentoring experiences than women was supported. Fifth, we

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
						had hypothesized that men would report better mentoring than women in their initial employment positions. We did not, however, receive support for this hypothesis. Overall, our data are in line with the SCCT model, in that women are less likely than men to report having received strong mentoring across all levels of training, likely because, at least in part, there are fewer female faculty members available to mentor them. We reported, for example, that women were less likely than men to have undergraduate professors help them in choosing a graduate school; yet, women who did receive help were more likely to receive help from a woman than a man who did receive help.
Aaltio & Huang (2007)	Women managers'	China	Not mentioned	RQ1. How do Chinese women managers frame	Qualitative (Interviews)	In the interview interpretations two career scripts were found: high future expectations and strong belief

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
	careers in information technology in China: high flyers with emotional costs?			the subjective experience of "career"? RQ2. What can be learned about cultural, institutional and organizational values and priorities from the subjective expression of individually experienced lives? RQ3. What are the barriers handicapping women from entering senior managerial jobs? RQ4. How do women managers		in own capacity. One of the major barriers for Chinese women's career development in IT is the work-life conflict. Women need to redefine their identities at work and in the family. They have to give priority to work if they want to gain a position in top-level management. The personal networks of the women in our study supported their participation in working life, but emotional costs were reported as well. The conflict reflects the influence of traditional Chinese culture on women. Secondly, career is a way for women to gain economic independence, achieve self-development and advance to top management positions. Thirdly, women can successfully pursue a managerial career in a technological field, and this depends on individual excellence and a successful fit with

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
				balance work and life? RQ5. What is the cultural framing of an "ideal woman"?		the organization. The findings of our study further indicate that an androgynous manager is a model which is expected also of women managers in the IT profession.
Watkins et al., (2006)	Making sense of the barriers women face in the information technology work force: Standpoint theory, self-disclos	USA	Standpoint Theory and the Communication Boundary Management Theory	In the current study, the authors women working in IT to discuss perceived workplace barriers and voluntary turnover.	Qualitative (Focus Groups)	A map that reveals eight concepts the women explicitly identified as central to the issues of workplace barriers and voluntary turnover. These concepts were: Turnover, Promotion Barriers, Lack of Consistency, Discrimination, Work Stress, Managing Family Responsibilities, Job Qualities, and Work Schedule Flexibility. the five concepts that were implicitly identified: Promotion Barriers, Work Stress, Work Schedule Flexibility, Lack of Respect, and Ageism.

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
	ure, and causal maps					
Settles et al., (2006)	The climate for women in academic science: The good, the bad, and the changeable	USA	Deficits Theory	The goal of the current study was to examine how general features of the climate, as well as specific experiences (i.e., sexual harassment and gender discrimination), relate to important job outcomes for women faculty in science.	Quantitative (Survey)	Hierarchical multiple regression results indicated that women scientists experiencing more sexual harassment and gender discrimination reported poorer job outcomes. Additionally, perceptions of a generally positive, nonsexist climate, as well as effective leadership, were related to positive job outcomes after controlling for harassment and discrimination.
Schmader et al., (2004)	The costs of accepting gender differen		Not mentioned	Two studies were designed to examine the costs of stereotype endorsement for women's self-	Quantitative (Survey)	Specifically, women majoring in male-dominated fields who believe that status differences between men and women in society are legitimate are more likely to endorse gender stereo- types about women's math

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
	ces: The role of stereotype endorsement in women's experience in the math domain			perceptions, career intentions, and susceptibility to stereotype threat in the math domain. 1) To the extent that some women might endorse gender stereotypes about women's math ability, what factors predict these be- liefs? and (2) What relation does stereotype endorse- ment have to women's attitude toward math, their motivation to enter math-related disciplines, and their performance		ability. Women's endorsement of gender stereotypes also predicts less desire to attend graduate school in one's major, lower performance self-esteem, and lower confidence in one's abilities. 999; Beyer, Rynes, Perrault, Hay, & Haller, 2003). The present data indicate that the endorsement of gender stereotypes about math ability could play a significant role in undermining women's confidence, thereby in- creasing the risk that many women who are in math- related majors will leave their majors or avoid related careers. Although results replicated the basic stereotype threat effect found in other research (i.e., women tended to do worse on a math test when gender identity was salient than when gender was not mentioned), this effect was moderated by women's beliefs

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
				outcomes on tests of their math ability?		about gender stereo- types. Women who indicated some belief that the stereotype about women's math ability might be ac- curate performed worse on the test when their gen- der identity was made salient. An unexpected finding was that women who rejected the stereotype did not just show a weaker effect of the stereotype threat manipulation, but actually showed no effect at all.
Miller (2004)	Frontier masculinity in the oil industry: The experience of women engineers	Canada	Feminist theoretical framework	This study contributes to the empirical evidence in the area of gendered organizations (Martin and Collinson, 2002) and their effects on the women who work in them	Qualitative (Ethnography, interviews, document analysis, journaling)	Themes: Everyday interactions, gendered division of labor, symbolic roots in the Frontier myth and the cowboy hero, strategies for coping with the culture.

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
				through an interpretive, ethnographic analysis of the oil industry in Canada, specifically Alberta.		
Ranson (2003)	Beyond 'gender differences': A Canadian study of women's and men's careers in engineering	Canada	Career Path (Brown, 1982)	The substantive objective was to examine the career paths of a group of women and men who graduated as engineers in a particular social and economic environment in western Canada. The theoretical and methodological objective was to do so from a perspective which	Mixed methods (Survey + Interviews)	Three career paths provide the focus for the study: the 'organizational', characterized by stable employment with one employer; the 'occupational', characterized by mobility between employ- ers; and the entrepreneurial, characterized by self-employment. The use of the career path framework moves the study beyond global comparisons (of the dichotomized 'gender differences' kind) between 'the women' and 'the men'. As well as allowing for comparison between the paths, it allows more refined and contextualized comparisons within

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
				did not lose sight of gender as an important analytic lens, but which also tried to avoid the 'slide into dualism' identified by Thorne (1997).		each path. Such comparisons produce patterns of similarity and difference that sometimes transcend gender.
Fouad et al., (2016)	Comparison of women engineers who persist in or depart from engineering	USA	Social Cognitive Career Theory & Integrated model of career change	The current research examined differences between women engineers who persisted in an engineering career versus those who left engineering	Quantitative (Survey)	Contrary to much of the popular press and our first two hypotheses, we did not find any differences in multiple domains of self-efficacy and outcome expectations between women who stayed and those who left engineering. Further, we did not find any support for our predictions that the two groups of women would differ on their vocational interests or the workplace barriers that they experienced. Of the different hypotheses derived from unifying the SCCT and the Rhodes and Doering models, the results

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
						showed that women who stayed and those who left the engineering field differed in their experience of workplace supports particularly in terms of content specific support such as reporting better provision of advancement opportunities and greater understanding from their managers for balancing their work and family roles. However, the two groups of women engineers did not differ in their perceptions about their organization's general expressions of care toward their overall well-being, which is indicative of content general support. Juxtaposing these findings suggests that type of workplace support matters; specifically, our findings suggest that content specific support may have greater relevance in understanding choice behavior than content general

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
						support. Women who persisted in engineering also re- ported higher levels of occupational commitment than those who left the engineering field. Engineering turnover intentions and occupational commitment emerged as the two key variables that explained 33.4% of the variance in persistence in engineering careers. Cumulatively, these findings suggest that it is not the lack of self-confidence or changing interests, or for that matter, work role related stressors and micro-aggressions that distinguish who stays and who leaves the engineering field. It is the more formative, developmental experiences reflected in tangible advancement opportunities and empathic support from their managers for their work-life roles, along with enduring attitudes and

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
						cognitions about the engineering profession, which serve to characterize and catalyze the persistence and attrition decisions of women engineers.
Kameny et al., (2014)	Barriers to Career Success for Minority Researchers in the Behavioral Sciences	USA	Not mentioned	The goal of this article is to examine barriers to career success in the behavioral sciences for ethnic/racial minority and women researchers, focusing on four broad categories of career barriers—institutional, cultural, skills, and personal.	Qualitative	A total of 141 barrier statements were obtained from 43 participants and coded into subcategories. Thirty-five percent of the barriers listed fell in the institutional category; 28% were cultural, 26% were personal, and 11% were skills barriers.
Singh et al., (2013)	Stemming the	USA	Social Cogniti	This study examined	Quantitative	The authors found that self-efficacy and outcome expectations

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
	tide: Predicting women engineers' intentions to leave		ve Career Theory, turnover models	influences on the organizational turnover intentions of women engineers as a first step in understanding the reasons for their high departure rate from the engineering profession.		influenced women engineers' job satisfaction and organizational commitment, which in turn influenced their turnover intentions. We also considered what role, if any, supportive HR practices in the form of developmental opportunities played in influencing engineers' job attitudes and their subsequent turnover intentions. The results pointed out that the availability of developmental opportunities at work are related to higher self-efficacy and outcome expectations, and indirectly, are also related to positive job attitudes. Taken together, these results offer new and thought-provoking insights into the process of making career decisions among highly skilled employees who are contemplating quitting their jobs. Our findings support the prediction that SCCT constructs of

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
						self-efficacy and outcome expectations play an important, but distal, role in influencing turnover intentions, and they do it through their effect on job attitudes. Specifically, we found that supportive organizational practices, in particular, the availability of developmental opportunities such as training and professional development programs, are positively related to women's engineering task self-efficacy and also the positive outcomes they expect from successfully performing engineering tasks. Outcome expectations, in turn, were found to be positively related to job attitudes in that the more positive the outcomes engineers expected from performing their tasks, the greater their levels of satisfaction with their jobs and loyalty toward their

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
						organizations, and lower their intentions to leave their organizations.
Hatmaker (2013)	Engineering Identity: Gender and Professional Identity Negotiation among Women Engineersg	USA	Identity Theory	The article considers how women construct their professional identity in a gendered profession by examining interpersonal interactions that marginalize their professional identity. It explores strategies they employ in response to these encounters and the consequences to their sense of self	Qualitative (Interviews)	The author labelled these interactions marginalizing interactions and identified four ways these interactions marginalized participants' professional identity: (a) by amplifying gender, (b) by imposing gendered expectations, (c) by tuning out and (d) by doubting technical abilities.

Table 1. Continued

Author(s) (Year)	Title	Context	Theory Used	Purpose or Research Questions	Research Design & Methods	Findings
				and belonging in engineering.		

CHAPTER III

METHODOLOGY

The overarching purpose of this dissertation study is to explore the career experiences of women in STEM fields in Lebanon. To address this purpose, I adopted a social constructivism perspective and a qualitative research design. Chapter III describes the rationale behind my methodological choice. This chapter also provides details regarding my research philosophical orientation, sampling and recruitment procedures and methods for data collection and analysis. The chapter concludes with a discussion about the strategies I used to ensure trustworthiness and my role as a researcher.

Qualitative Research

In this section, I will briefly introduce qualitative research and its characteristics. Then, I will elaborate on the rationale for using the basic qualitative research approach to this study.

Nature of Qualitative Research and its Characteristics

Understanding the paradigm debate between quantitative and qualitative research helps clarify our understanding of qualitative research as a methodology that fits the purpose of my study. The debate centers around what constitutes "good" research and high-quality evidence (Patton, 2015), that is, (a) using quantitative and experimental methodologies to derive and test hypothetical-deductive generalizations, or (b) using qualitative and naturalistic approaches to inductively and holistically understand human experience in context-specific settings. The importance of understanding the alternative paradigms that guide our inquiry is to attest to the *methodological appropriateness* as a

primary criterion for judging methodological quality and recognizing that different methods are appropriate for different situations (Patton, 2015). In what comes next, I will provide an overview about the nature of qualitative research and its characteristics.

Qualitative research is an "approach for exploring and understanding the meaning individuals or groups ascribe to a social or human problem" (Creswell, 2015, p. 4). The evolving definition of qualitative research by Denzin and Lincoln (2000, 2002, 2005, 2011) conveys the ever-changing nature of the qualitative inquiry from social construction, to interpretivism, and on to social justice in the world. Their latest definition is as follows:

> Qualitative research is a situated activity that locate the observer in the world. Qualitative research consists of a set of interpretive, material practices that make the world visible. These practices transform the world. They turn the world into a series of representations, including filed notes, interviews, conversations, photographs, recordings, and memos to the self. At this level, qualitative research involves an interpretive, naturalistic approach to the world. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them (Denzin & Lincoln, 2011, p. 3).

In naturalistic inquiry, the researcher is the primary data gathering instrument (Lincoln & Guba, 1985). Second, the research is inductive and the design emerges as the inquirer collects and analyzes the data simultaneously (Lincoln & Guba, 1985). Third,

qualitative researchers aim to understand the meaning people attribute to their world in their natural environment (Merriam, 2009).

Merriam and Tisdell (2016) identified four characteristics that are considered to be key to understanding the nature of qualitative research:

a. the focus is on the process, understanding, and meaning;

b. the researcher is the primary instrument of data collection and analysis;

c. the process is inductive; and

d. the product is richly descriptive

In addition, qualitative researchers use purposive sampling to select participants who present adequate accounts of the phenomenon under study (Lincoln & Guba, 1985). They also resort to elements of trustworthiness and credibility to ensure rigor of the data collected (Lincoln & Guba, 1985).

Finally, interpretivist research is the most common type of qualitative research, which assumes that the reality is socially constructed; therefore, there is no single observable reality (Merriam & Tisdell, 2016). This is in contrast to the positivist orientation (mostly ascribed to quantitative research) that assumes that reality exists "out there", and that the reality is observable, stable and measurable (Lincoln & Guba, 1985). In this sense, qualitative inquiry seeks to generate working hypotheses and thick description of individuals embedded in context (Lincoln & Guba, 1985), while quantitative research aims to develop generalizable knowledge, free of context and time (Lincoln & Guba, 1985).

Rationale for Using Qualitative Research

In this study, I adopted a qualitative research design. This methodological choice is driven by the nature of my research purpose and questions and my philosophical orientation. In the following paragraphs, I will explain each aspect in detail.

Nature of Research Purpose and Questions

Qualitative research inquiries into, documents, and interprets the meaning-making process (Patton, 2015) of participants. A qualitative researcher aims to gain an in-depth, individualized, and contextually sensitive understanding of a particular phenomenon. Crotty (1998) suggested that the purpose and questions of a research study determines why the researcher employs a particular methodology. The exploratory nature of my study (to explore the career experiences of women in STEM fields in Lebanon) makes the qualitative approach most suitable. Through this approach, I am able to capture and understand the career experiences of these participants from their own perspective. Thus, the nature of my research questions (What leads women to enter STEM fields in Lebanon? What are the career experiences of women professionals in STEM fields in Lebanon? What impacts women's experiences in STEM careers in Lebanon?) are best answered through a qualitative methodology. Qualitative research allows me to explore in depth the career experiences of women in STEM fields in Lebanon and to understand how they construct their careers and make sense of them (Merriam, 2009).

Philosophical Orientation

Various philosophical assumptions are behind undertaking a qualitative study (Creswell, 2013). First, from an *ontological* perspective, qualitative researchers embrace the idea of multiple realities and intend to report them (Creswell, 2013). Second, from an *epistemological* stand point, a qualitative study means that researchers try to get as close as possible to the participants being studied. Knowledge is known through the subjective experience of people (Creswell, 2013). Further, qualitative researchers make their values known in a study, which is an *axiological* assumption. The researcher acknowledges that the stories voiced represent an interpretation and presentation of the researcher as much as the subject of the study (Denzin, 1989). Finally, a qualitative *methodology* is inductive, emerging and shaped by the researcher's experience in collecting and analyzing the data (Denzin, 1989).

Denzin and Lincoln (2011) consider the above as key premises that are folded into the interpretive framework used in qualitative research. My understanding of the nature of knowledge aligns with the constructivist epistemology since I believe meaning making is constructed through the interaction with others and through historical and cultural norms that operate in an individual's life (Denzin & Lincoln, 2011). Furthermore, like other constructivists, I believe that multiple realities are constructed by different individuals as a result of their different interactions with the same social phenomenon (Crotty, 1998). Hence, I am interested in studying these multiple realities and their implications for the lives of different individuals (Patton, 2002).

In contrast to the positivistic view, the constructivist perspective views "truth" as a matter of consensus among informed and sophisticated constructors, not of correspondence with objective reality (Guba & Lincoln, 1989). In addition, the constructivist researcher is subjective and value-bound (Lincoln & Guba, 1985).

As a constructivist researcher, I seek to study the multiple realities constructed by different groups of people (women working in STEM fields in Lebanon for this study) and the subsequent implications of those construction on their lives and interactions with others (Patton, 2015). Additionally, I share the three assumptions Crotty (1998) identified while discussing constructivism:

a. Human beings construct meanings as they engage with the world they are interpreting.
b. Humans engage with their world and make sense of it based on their historical and social perspectives.
c. The basic generation of meaning is always social, arising in and out of interaction with a human community.

The above mentioned philosophical perspective fits within the qualitative research paradigm and thus guides my methodological choice.

Qualitative Methodologies

In this section, I begin by providing a brief overview of different qualitative methodologies. I then present specifically the methodology for my study as well as the steps in the research design.

Ethnographic Research

Ethnography, the primary methodology of anthropology, is the earliest distinct tradition of qualitative inquiry (Patton, 2015). Ethnography is a qualitative design in which the researcher describes and interprets the shared and learned patterns of values, behaviors, beliefs, and language of a culture-sharing group (Harris, 1968).

Narrative Research

As a methodology, narrative research begins with the experiences as expressed in lived and told stories of individuals (Creswell, 2013). Czarniawska (2004) defined it as a specific type of qualitative research in which "narrative is understood as a spoken or written text giving an account of an event/action or series of events/actions, chronologically connected" (p. 17).

Phenomenological Research

Whereas a narrative study reports the stories of experiences of a single individual or several individuals, a phenomenological study describes the common meaning of several individuals lived experiences of a concept or phenomenon (Creswell, 2013). The basic purpose of phenomenology is to reduce individual experiences with a phenomenon to a description of the universal essence (Van Manen, 1990).

Grounded Theory Research

This qualitative design was developed in sociology in 1967 by Barney Glaser and Anselm Strauss who argued that theories "should be grounded in data from the field, especially in the actions, interactions, and social processes of people" (Creswell, 2013, p.84). While narrative research focuses on individual stories told by participants, and

phenomenology emphasizes the common experiences for a number of individuals, the intent of a grounded theory is to move beyond description and to generate or discover a theory for a process or an action (Strauss & Corbin, 1998). Hence, the difference lies in the grounded theory's focus on building and developing a substantive theory (Corbin & Strauss, 1990).

Case Study Research

A case study involves conducting research within a real-life, contemporary context or setting (Yin, 2009). Yin (2013) defines a case study "as an empirical inquiry that investigates a contemporary phenomenon (the "case") within its real-life context, especially when the boundaries between phenomenon and context may not be clearly evident" (p. 16). The unit of analysis, not the topic of investigation, characterizes a case study (Merriam & Tisdell, 2016).

Basic Interpretive Qualitative Study

As I have previously mentioned, my methodological choice is driven by my constructivist philosophical perspective. Specifically, I adopted the basic qualitative research/naturalistic inquiry methodology to this study because it is informed by the constructivist epistemology (Lincoln & Guba, 1985; Merriam, 2009; Merriam & Tisdell, 2016). As Merriam (2009) noted, the interpretive qualitative researchers are interested in understanding "how people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences" (p. 23). With this approach, I was able to *understand* how women in STEM careers in Lebanon make sense of their lives and construct their career experiences. This approach also enabled

me to understand the motivation behind the participants' pursuit for a career in STEM and the issues that have influenced their career experiences.

It is important for me to distinguish my methodological choice from other qualitative approaches discussed above. A basic qualitative study, as I adopted for this investigation, does not focus on culture (ethnography), stories (narrative analysis), theory building (grounded theory), one specific case (case study), or the essence of lived experiences (phenomenology) (Lichtamn, 2012). Instead, the primary goal of a basic qualitative study is "to uncover and interpret the meaning that is constructed by people and how they make sense of their lives and their worlds" (Merriam, 2009, p. 24).

Hence, to re-iterate, a basic interpretive qualitative study (a) focuses on understanding the meaning people construct and attribute to their experiences, (b) is carried out in the natural setting since the context is so heavily implicated in meaning, (c) relies on the researcher as the primary data gathering instrument, and (d) uses inductive data analysis methods to identify the multiple realities (Lincoln & Guba, 1985).

Steps in the Research Design

Merriam (2009) defines a series of steps for designing a basic interpretive qualitative study. Below, I discuss the steps I followed to conduct my dissertation study

(see Figure 3).

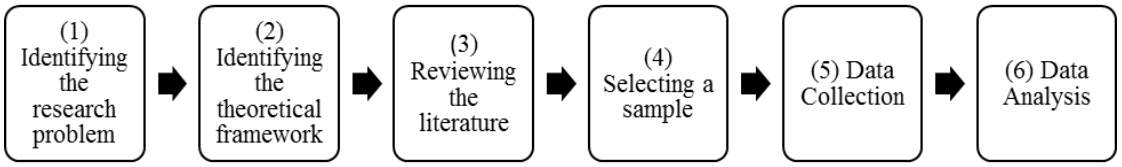


Figure 3. Research Design Steps

Identifying the Research Problem. The research problem arises from the researcher's curiosity towards a particular topic after which he/she delves into the literature to gain an understanding of the issue in order to identify certain gaps that their research can address (Merriam, 2009). Following the structure of a traditional dissertation in Chapter I, I have provided the background and the rationale for the study. I have then narrowed down the problem into the research purpose and questions.

Identifying the Theoretical Framework. The theoretical framework is how theory fits into research; it includes the disciplinary orientation, concepts, models, and theories that inform the research process (Merriam, 2009). The phenomenon in this study is informed by career development theories, specifically, career construction theory (Savickas, 2002). In Chapter II, I reviewed three career development theories that informed my study and detail the career construction theory as the most relevant theory.

Reviewing the Literature. After identifying the theoretical framework for my study, it is important to situate the research problem in the literature. The literature review should set the stage for the study and show how the study contributes to the existing knowledge (Merriam, 2009). The existing empirical studies on the career experiences of

women in STEM fields informs my study. A review and a summary of those studies are presented in Chapter II, helping me to ground my topic, problem statement, and later my findings in the literature and to highlight the significance and contributions of my research.

Selecting a Sample. After determining the problem and reviewing the literature, the researcher needs to identify what, when, where, and whom to observe or interview (Merriam, 2009). Selecting a sample that will provide information rich data (Patton, 2002) is the key to this step of the research design.

Participants

The participants in this study are 21 women working in any of the STEM fields in Lebanon. The following table provides a snapshot of the participants.

Table 2.

Study participant's profile

Pseudonym	Job	Industry
Samar	Architect & senior university lecturer	Architecture
Nay	Senior architect	Architecture
Rand	Co-founder & managing partner (automotive)	Engineering
Dima	Partner, engineering firm	Engineering
Shireen	Assistant project engineer	Engineering
Dalia	Senior Engineer, Office of the Prime Minister	Engineering
Nadine	Engineer and project manager	Engineering
Nisreen	Associate professor	Math
Zeina	Founder of a social innovation start-up & university lecturer	Math
Amal	Assistant dean	Math
Rasha	Chairperson & associate professor of clinical specialty	Medicine

Table 2. Continued

Pseudonym	Job	Industry
Leyla	Anesthesiologist	Medicine
Sara	Orthopedic	Medicine
Lama	Founder of a technology start-up	Technology
Reem	Managing partner of an engineering startup	Technology
Nada	Committee chair, Smart Cities Association	Technology
Noha	User experience & digital strategy consultant	Technology
Fida	Founder of a technology start-up	Technology
May	Managing director of a global technology firm	Technology
Lara	ICT & Robotics coordinator and mentor	Technology
Jana	System analyst	Technology

Sampling Procedures

To recruit potential participants for this study, I used the criterion-based sampling strategy (Patton, 2015). The following four criteria guided the participant selection.

a. Born and raised in Lebanon (Lebanese): For the purpose of this study, it is necessary that the participants were born and raised in Lebanon.
b. Be a female*:* Since I am focusing on the career experiences of women, my participants have to be females and identified as "woman" with respect to their gender identities.
c. Work in one of the STEM fields in Lebanon for a minimum of eight years: To be included in this study, the participants need to have worked for at least eight years in any of the STEM fields in Lebanon. The number of years will allow the women to gain meaningful experiences (Ward, Okura, & Kennedy, 1998).

d. Employed at the time of the study: In order to gather rich data (Patton, 2002), the participants should be employed full time in any of the STEM fields during the time of the study.
e. Can speak one of the three recognized languages in Lebanon (Arabic, English, and French).

In addition to the above criteria, I also used the snowball sampling method (Patton, 2015). With this technique, my participant made referrals to their contacts who they believe would fit the sampling criteria of the study.

Recruitment Procedures

I used four strategies to recruit my participants:

a. Personal and professional contacts: As a first step, I relied on my personal network in Lebanon. I sent an email invitation to my direct contacts who work in STEM fields and invited them to participate (Appendix A). I then asked my professional network in Lebanon (e.g., professors) to forward the email invitation to people they think might meet the inclusion criteria.
b. Use of social media platforms: I shared the invitation on both my LinkedIn and Facebook accounts as well as on the pages of the various STEM institutions in Lebanon.
c. Identify professional women organizations: I reached out to the Lebanese League for Women in Business (LLWB) that has an established STEM committee. I shared my email invitation with the head of the committee and requested her to share it with the committee members. I also identified other organizations in

Lebanon that are working on promoting STEM education and employment and connected with their members and organizers.

d. Flyers: I left recruitment flyers (Appendix B) in public places, mainly in areas where various STEM organizations are located (e.g. Downtown Beirut). I also asked the permission to place the flyers on university campuses in Lebanon in order to attract scholars who work in those fields.

Ethical Considerations

Before I begin the procedures described above, I followed Texas A&M University's IRB regulation and obtain an approval to conduct my study. Specifically, I adhered to the IRB protocol throughout my research: (a) I used the informed consent forms (Appendix C and D), (b) I kept the data confidential, (c) I assigned pseudonyms to my participants to ensure anonymity, and (d) I protected the data in encrypted files.

Collecting the Data. The basic interpretative qualitative study calls for the use of criterion-based sampling, interviewing and comparative analysis (Merriam, 2009). As discussed earlier, I used a combination of criterion-based and snowball sampling techniques to recruit my research participants. For data collection, I conducted in-depth interviews and took extensive field notes.

Interviews

Through interviews, researchers can "enter into the other person's perspective" (Patton, 2015, p. 426). Interviewing is necessary when we cannot observe behavior, feelings or how people interpret the world around them. Interviewing approaches are grounded in the different qualitative inquiry traditions and frameworks. As such,

different inquiry approaches require different questions and fieldwork methods (Patton, 2015). The goal of my interviewing was to understand, through dialogues with my study participants, how they experience or have experienced their career in STEM fields in Lebanon.

In specific, I used semi-structured in-depth interviews as the primary source of data, and this method is informed by the basic qualitative approach (Merriam, 2002). Semi-structured interviews with open-ended questions will generate contextually rich descriptions and yield deep insights into participants' experiences (Patton, 2002).

I collected the data through two rounds of face-to-face interviews with each participant. The interviews were conducted during the day, at a location that best fits the interviewee's convenience, and in the language selected by the participant (Arabic, English, or French). Before the interview began, I walked the participants through the informed consent form (Appendix C and D) and answered any questions that she had. The first round of interviews served two purposes: (a) gaining a big picture of the participants' career experience in STEM (each lasting for approximately 20 minutes); and (b) building rapport with the participants. The second round of interviews was conducted to gain a deeper understanding of various motivators and influencers that the women faced while working in STEM in Lebanon (approximately 60 minutes). After the interview was transcribed, I contacted the participants for a brief discussion to share the findings of the study and collected their feedback.

I conducted each interview using an interview guide (Appendix E) with a list of pre-developed questions (Patton, 2015). The interview questions centered around the

career experiences of women in Lebanon and sought to understand how they constructed their careers. To ensure the effectiveness of my interviews, I conducted pilot interviews with four women professionals working in STEM fields in a large research intensive university. The interviewees gave me feedback on my interview questions and their input was incorporated into final interview guide.

Field notes

For my study and during my interviews, I took field notes to compliment my interview data and to capture the context, non-verbal behavior, feelings and any other important observations (Patton, 2015). Also, by taking field notes, I was able to record my own feelings, reactions to the experiences and a reflection about the personal meaning and significance of what I have observed (Patton, 2015). My field notes contained information on what is being experienced and observed, quotations from the people observed, my feelings and reactions to what I was observing and field related insights and interpretations. I also kept a reflexive journal to record my thoughts after each meeting with my participants.

Analyzing the Data. Data analysis in qualitative research is simultaneous with data collection (Merriam & Tisedell, 2016) and is both recursive and dynamic. Flick (2014) describes the process of data analysis as "the classification and interpretation of linguistic (or visual) material to make statements about implicit and explicit dimensions and structures of meaning-making in the material and what is represented in it" (p. 5). Thus, qualitative data analysis is a process that synthesizes the socially constructed data and reconstructs them into meaningful wholes (Lincoln & Guba, 1985). Qualitative data

analysis is an inductive process which begins with no theory or hypothesis in the researcher's mind (Lincoln & Guba, 1985). However, qualitative data analysis is guided by the research purpose and questions (Merriam, 2009). I approached my data with no predetermined framework in mind and I allowed the themes to emerge from the data itself.

To start my data analysis process, I first transcribed the interview recordings verbatim. I gave each interviewee a pseudonym for the purpose of confidentiality. The corresponding names were kept in a separate electronic file and stored confidentially in an encrypted folder. I then created an inventory of all interview transcripts and entered them into SQR NVivo software for coding and analysis.

Qualitative data analysis is primarily *inductive* and *comparative* (Merriam & Tisdell, 2016). In this study, I used the constant comparative method (Glaser & Strauss, 1967; Lincoln & Guba, 1985) to analyze the interview transcripts (Charmaz, 2014). This method includes coding incidents for a category and then comparing them with other incidents across all categories (Glaser & Strauss, 1967; Lincoln & Guba, 1985). I followed the two steps below:

a. Coding or unitizing: The overall process of data analysis begins by identifying segments in the data set that responds to the research questions (Merriam & Tisdell, 2016). This segment is a unit of data. According to Lincoln & Guba (1985), a unit must meet two criteria: (a) be heuristic; and (b) be the smallest piece of information that can stand by itself. The next step is to reduce the data into codes. I started with coding the first interview by reading the transcript as

well as any relevant field notes. I then coded for units of meaning and assigned each unit an Nvivo code (Merriam, 2009). I repeated the steps for the remainder of the transcripts and updated Nvivo with the codes. I also kept a journal in order to write down my memos regarding the patterns I observed in the data.

b. Categorizing: The construction of categories is highly inductive, whereby detailed bits or segments of data related to each other are gathered into clusters of data (Merriam & Tisdell, 2016). This results in the creation of a category that will bring together the units of meaning or codes relating to the same content (Lincoln & Guba, 1985). I compared one unit of information with the next, looking for recurring regularities in the data. I applied the constant comparison method in order to create the categories. The categories were saturated when no new information is being added and the codes are being repeated. Each saturated category consists of subcategories and properties that define its unique characteristics. I reflected on my categorization decisions through journaling.

Data Report

As discussed above, the research purpose guides data analysis and data reporting (Patton, 2015). While writing, I am highly aware of my audience and what I intend to communicate to them (Weiss, 2001). In my study, my audience are academics and thus my writing follows scholarly format and guidelines. Further, analysis and reporting are where reflexivity comes to the center (Patton, 2015). As a qualitative researcher, reflexivity reminds me "to be attentive to and conscious of the cultural, political, social, linguistic, and economic origins of one's own perspective and voice as well as the

perspective and voices of that one interview and those to whom one reports" (Patton, 2015, p. 604).

In my study, I also used thick description to report my findings. Rich narratives and direct quotes constitute the foundation of qualitative inquiry (Patton, 2015). Thick description "goes beyond mere fact and surface appearances. It presents detail, context, emotion, and the webs of social relationships that join persons to one another" (Denzin, 1989, p. 83). In thick description, the voices, feelings, actions, and meanings of individuals are heard (Denzin, 1989). I thus described my participants and the context of the study in details. I used quotes directly from the participants to support and enrich my categories and subcategories. The final report reflects both my interpretations and my participant's voice.

Trustworthiness

To establish the trustworthiness of a qualitative study, Lincoln & Guba (1985) outline several criteria—credibility, authenticity, transferability, dependability, and confirmability. For this study, I used three strategies:

a. Member checking: This technique is considered by Lincoln and Guba (1985) to be "the most critical technique for establishing credibility" (p. 314). In this approach, the researcher takes the data, analyses, interpretations, and conclusions back to the participants so that they can judge the accuracy and credibility of the account (Creswell, 2013). I sent my findings to my participants and asked them to verify the accuracy of the findings and my interpretations. Some of the participants responded by either sharing with me more examples regarding a

particular point or providing some input on the categories. An example of member checking is provided in Appendix G.

b. Peer review or debriefing: This technique provides an external check of the research process (Lincoln & Guba, 1985; Merriam, 2009). I used peer-debriefing at various stages of the study. I tested my interview questions with a colleague before I started interviewing my participants. I also shared and ask for feedback from a qualitative research expert on the emerging categories and themes that I have identified. For example, throughout the data collection and analysis processes, I sought constant assistance from my dissertation chair, who is an experienced qualitative researcher. Together, we discussed the effectiveness of the interview questions and the accuracy of each category created. My dissertation chair served as a quality controller for my study.

c. Reflexive journal: As a qualitative researcher, I documented my reflections on what happened during my data collection and engagement in the field by keeping a personal log (Lincoln & Guba, 1985). I also kept a journal to keep track of my decisions, questions, and observations throughout the research process. By journaling, I remained highly aware of the biases, assumptions, and experiences I might bring to the research process, which helped me determine every step of the way, how I could bracket my impact on the research findings. An example is presented in Appendix (I).

The Researcher's Role

Since the researcher serves as the primary instrument in qualitative inquiry, it is then important that I discuss my identity, background, and positionality, and how they may collectively impact my study. By being transparent and reflective from the beginning, I was able to recognize my values, beliefs, subjectivities and find ways to bracket my own influence on the study (Patton, 2002). Below I share a bit about my background relevant to this study.

I am an Arab Middle Eastern, 28-year-old woman, born and raised in Lebanon. I was raised by Lebanese parents in Lebanon and belong to a minority religious group. I completed my high school, undergraduate and graduate education back home. My schooling has been profoundly American: both my high school and university follow the American educational system. After completing my master's degree in human resource management in Lebanon, I moved to the United States as an international student to pursue my Ph.D. in Human Resource Development. I am currently a doctoral candidate at a large research-intensive university.

Being a Lebanese woman who has had a professional work experience in Lebanon gives me an emic perspective (insider's view) (Patton, 2015) into my research topic. I am more capable of understanding and relating to my participants' experiences than someone who has not worked in Lebanon and who is not a woman. In addition, having a mother and two sisters who are also professionals working in Lebanon and have faced various challenges as career women motivated me to explore the career experiences of women in Lebanon. Further, through my interaction with other

professional women around me in Lebanon, I realized that most of them work in the educational, health (mainly nursing) and administrative sectors in Lebanon. After hearing about their experiences in these sectors, I became more motivated to conduct a research study to understand the career experiences of women in STEM fields in Lebanon. Nonetheless, I am aware of my bias as a woman who worked in Lebanon for a handful of years and who have known about other women's career stories and struggles. As such, I have tried my best to bracket my bias and stay neutral during the stages of data collection and analysis. I remained highly conscious during my interviews with the participants and consciously refrained myself from asking leading questions so that my participants could freely express their own thoughts.

Finally, since I have never worked in any of the STEM fields in Lebanon nor had the chance to meet women who work in those fields prior to this study, I consider myself as an outsider with an etic perspective (outsider's view) (Patton, 2015). As a result, I may have missed patterns and trends that an insider may have. However, on the positive note, being an outsider enabled me to remain objective and gain fresh perspectives an insider may not have.

Summary

Guided by the constructivist paradigm, this study adopted a basic interpretive qualitative research approach. Through this approach, I was able to obtain an in-depth understanding of the women's career experiences in STEM fields in Lebanon. To identify participants, I used purposeful and snowball sampling strategies. For data collection, I conducted semi-structured interviews complimented taking field notes and

research journaling. The qualitative data was analyzed using the constant comparative methods.

CHAPTER IV

FINDINGS

Overview

The previous chapter described the methodology and methods applied in this study, including the research design, sampling strategy, data collection and data analysis methods. This chapter presents major findings related to the three research questions. The chapter begins with a description of the study participants and an overall presentation of the categories that emerged from the data analysis. It then moves to detailed discussion about each category and its respective properties. Direct quotes from the participants were used as supporting evidence. The chapter concludes with a summary.

Study Participants

Twenty-one women working in various STEM fields in Lebanon participated in my study. In this section, I describe the participants' demographic characteristics, educational backgrounds, and work experience. Ten of the women are married and have two children on average. All of the women hold at least a bachelor's degree in their field, with 16 women having a graduate or a terminal degree. Most of the women were educated in private universities in Lebanon with a couple of them attending the public Lebanese University. Further, some of the women pursued their graduate degrees abroad (e.g., U.S., Canada, and Spain), while others pursued advanced education in Lebanon, primarily at the American University of Beirut. The participants work in various industries, including technology (8 women), engineering (7 women), architecture (3

women), and mathematics (3 women). The participants have a minimum of eight years' of professional experience in Lebanon and work in both for profit, non-for profit organizations and academic institutions. It is worth noting that the years of experience indicated in the table below are not necessarily linear. For most of my participants, career interruptions have taken place for varied reasons. Further, the women changed various employers throughout their careers and more than half of the women (11) have started their own businesses and consider themselves as entrepreneurs. Table 3 presents the profile of each participant.

Table 3.

Study participants

Pseudonym	Job	Years of Experience	Industry	Education	Entrepreneur
Samar	Architect & senior university lecturer	8	Architecture	Ph.D. Candidate	Yes
Nay	Senior architect	9	Architecture	Bachelor Degree	
Rand	Co-founder & managing partner (automotive)	10	Engineering	Master's Degree	Yes
Dima	Partner, engineering firm	15	Engineering	Master's Degree	Yes
Shireen	Assistant project engineer	10	Engineering	Bachelor Degree	
Dalia	Senior Engineer, Office of the Prime Minister	9	Engineering	Master's Degree	
Nadine	Engineer and project manager	9	Engineering	Master's Degree	
Nisreen	Associate professor	15	Math	Ph.D.	
Zeina	Founder of a social innovation start-up & university lecturer	11	Math	Ph.D. Candidate	Yes
Amal	Assistant dean	20	Math	Ph.D.	
Rasha	Chairperson & associate professor of clinical specialty	18	Medicine	M.D.	
Leyla	Anesthesiologist	10	Medicine	M.D.	
Sara	Orthopedic	9	Medicine	M.D.	

Table 3. Continued

Pseudonym	Job	Years of Experience	Industry	Education	Entrepreneur
Lama	Founder of a technology start-up	10	Technology	Bachelor Degree	Yes
Reem	Managing partner of an engineering startup	11	Technology	Master's Degree	Yes
Nada	Committee chair, Smart Cities Association	10	Technology	Master's Degree	Yes
Noha	User experience & digital strategy consultant	10	Technology	Bachelor Degree	Yes
Fida	Founder of a technology start-up	12	Technology	Master's Degree	Yes
May	Managing director of a global technology firm	19	Technology	Master's Degree	Yes
Lara	ICT & Robotics coordinator and mentor	10	Technology	Bachelor Degree	Yes
Jana	System analyst	13	Technology	Master's Degree	

Categories

This section presents the key findings of this study. It starts with an overview of the categories and their properties, followed by detail analysis of these categories and their properties.

This section describes the categories and properties that I identified from data analysis. The five categories and 15 properties described in this section are summarized in Table 4. In the following sections, I describe each category and its properties in detail, along with direct quotes from the participants.

Table 4.

Finding's categories and their properties

Category	Properties

Vocational Choice	• Internal Influences
	  ○ Passion
	  ○ Initiative
	  ○ Commitment
	  ○ Curiosity

	• External Influences
	  ○ Family
	  ▪ Parents
	  ▪ Other family members
	  ▪ Spouse
	  ○ School
	  ○ Manager
	  ○ International exposure

Career Accomplishment	• Performance • Development • Recognition • Impact

Table 4. Continued

Category	Properties

Career Challenges	• Institutional Context
	  ○ Organizational System
	  ○ Culture System
	  ○ Legal System

	• Resource Scarcity
	  ○ Financial Support
	  ○ Career Guidance (Lack of Mentorship)

	• Gender Stereotypes
	  ○ At work
	  ▪ Proving oneself
	  ▪ Working hard
	  ▪ Age bias
	  ▪ Being a mother
	  ○ At home
	  ▪ Relationship with spouse
	  ▪ Different models of care

Coping Strategies	• Managing one's own career path
	  ○ Becoming an entrepreneur
	  ○ Taking control

	• Engaging in change management
	  ○ Influencing HR policy making
	  ○ Empowering other women
	  ○ Building trust with colleagues

	• Managing Conflict
	  ○ Adapting
	  ○ Confronting
	  ○ Seeking support

	• Outcome of Coping Strategies
Career Reflection	• Doing things differently • Engaging in self-reflection

Category 1: Vocational Choice

The first category is **Vocational Choice.** It refers to various personality factors as well as women's early experiences and interactions with others that ultimately affect the women's vocational selection. When asked about what career they decided to pursue, the participants discussed both internal and external influences that played a role in their career choice in STEM. The category of vocational choice thus includes two properties: *internal influences* and *external influences.* These two properties were features of what undergird women's vocational choice in STEM in Lebanon.

The first property, ***internal influences***, refers to the women's own personal attributes that influenced their decision to pursue a STEM career. The women's discussion of their own personal traits and skills further informed our understanding of their vocational choices. In what follows, women's narratives highlight their own internal meaning-making process consisting of passion, initiative, commitment, and curiosity, as four internal influencers.

Passion. Passion for pursuing a career in STEM was one of the major internal influences that the women discussed in reference to their careers. Passion here is defined as a strong inclination towards an activity (e.g., career in STEM in this case) that is important, liked and involves considerable time in its pursuit. For some of the women, the passion to pursue a career in STEM started from their childhood. For example, SAMAR discussed how her passion for architecture started when she was young:

> I love drawing. I love everything related to arts. I enjoy it, but at the same time I really enjoy looking at buildings, sketching them, understanding how their

> structure is. You might find this funny but to me a young kid, I was inspired by ants, because they had this way of building their own houses. I used to sit and watch them build their own houses, it was an inspiration ever since I was a kid. (SAMAR)

Similar childhood reflections were noted by RAND:

> I think it's innate. I think you have this interest as a person. And you either enjoy seeing things done or you don't. So, as a kid, I always felt so glad if I could fix something or put it together. For example, once I got a Barbie gift for Christmas. I cried my eyes out because I opened the box and saw a Barbie and wondered what I was going to do with it. Will I have to talk to it? So, I left the Barbie aside and I built her house. I built her house and I called my friend and invited her over to play with the Barbie and the house. So, I always had this interest. (RAND)

Further, SHIREEN and NADINE both highlighted their strength and love for mathematics as students, which later translated to pursuing careers in math and engineering:

> I felt that this is what I wanted. From the beginning, I knew that I wanted anything that has to do with math. I was very good in space geometry. I used to solve any problem in minutes. (SHIREEN)

> I was a very good student in physics and math. I applied for electrical engineering because I used to love the subject regarding the electrical parts in physics. (NADINE)

Interestingly, for AMAL her career pursuit in mathematics was shaped early on when she was denoted as a proficient student who can teach others math:

> Usually when people need help in studies it is usually in mathematics and sciences, and mostly in mathematics. I used to teach mathematics from an early age. I taught my youngest sisters math when they started having difficulties at school. When you teach math, you discover more and more its beauty, like any subject really, when you teach it you know it better, you know it more deeply and you start internalizing it. Then, I was the teacher of the neighborhood, our neighbors used to call on me to teach their children, so since my childhood I have been a teacher, and mostly a teacher of mathematics. (AMAL)

While for RASHA, her passion and understanding of the various specialties in the medical field allowed her to make a career choice that best fits with her ultimate career goal:

> I love emergency medicine but I also loved surgery. And I knew that I never wanted to become a surgeon because to become an excellent surgeon I felt I had to put in many more hours of my life into surgery than to become an excellent EM physician. But not to the extent that it forced me into something I didn't like. I mean I definitely enjoy my field and this was my passion. (RASHA)

For other participants, work was regarded as a life style and as something integral to who they are and what they love to do. For example, REEM explained:

> For me it's not work; for me this is the lifestyle that I chose- to be this productive and to see it more than just a job. It's literally a purpose and a way of life, and I

> feel that at this age this is the time that we need to invest in ourselves. I have the time, I have the energy to be able to do it and I do give it my all. (REEM)

In addition, SHIREEN discussed how her passion for her work is part of her personal life:

> I really like my work. I am the kind of person who doesn't like Saturdays and Sundays. I like the five days I spend at work. I enjoy going on vacation, but I am the kind of person that if I leave work, and there is something that I need to do, I stay up all night thinking about it. I do not detach. The days are linked until I finish the task I have been thinking about for work. (SHIREEN)

The passion to work for MAY was fueled by the constant change she faced at work. She described it as a major driver for her career pursuit:

> For me, it's a pleasure to work. My husband tells me, "take a break. you're exhausted". He's abroad and I have the responsibility for the home, the kids. I tell him that he doesn't understand that I love being at work. For me, it's the thing that keeps me moving on. And it's full of risk because there is no routine. Every day is different; every month is different. You don't have that standard stability. There are so many ups and downs. You meet so many people. And this is what's exciting about it. You're not really in an office doing bureaucratic work, you end up meeting so many people and learning from them, and sharing with them, and helping them. (MAY)

For DIMA, the love for her work equips her with the strength to continue and develop her career. While for NOHA her passion and perspective towards constantly exploring new avenues of development were integral of her career choice:

> The love and passion for my work are key to my career. I really work from my heart. And I never give up, this is another thing. I know a lot of people who give up. This is something that I will never do. I persevere till the end, till I finish what I intended to do. (DIMA)
>
> To me you can always find a passion in what you are doing. It's just the perspective you take and that is the approach I adopt. In this way, I was able to get better with what I do and discover new things. And I think I was lucky with the job that I took working as a digital strategy consultant. I mean I took very different types of jobs that completed my experience. (NOHA)

When discussing her mathematics domain, AMAL explained that even though her passion rests in math, she realized the weight of applying her mathematics skills to her society and decided that she has to add a more humane side to it. She shared:

> Because I love it (mathematics), I find it an ideal domain. It's a very interesting domain. For me it puts order in things, but after I finished my BS, I started shifting a little bit, especially with the influence of my minor degree in social sciences. I decided to give a more humane touch to mathematics. I mean when you major in pure mathematics you get into a world of perfection, of pure logic, and you start to see the whole world within a frame-work of logic, and this is very tiring, especially in our societies. (AMAL)

As for the women who chose a career in the technology space (e.g. computer science), their passion was linked to discovering new arenas and being able to exercise innovation:

> I like innovation. I like new things. I love technology. (LARA)
>
> When I decided to go for computer science, it was still new but I liked it. I was always comfortable with technology. Among the people I know, I was the first to have an email and used to love playing games. (NOHA)
>
> I was interested in computers, so I explored computer science which was still new in Lebanon, and I did it and I loved it. I love programming… and I am now always working in technical fields. (NADA)

Initiative. Initiative, as an internal influence, signifies the women taking an active and self-starting approach towards their careers. For the most part, most of the women discussed their initiative in seeking and honing down on opportunities to either kick start or develop their STEM careers. For example, RAND realized that there is an opportunity to establish an auto-mechanic German subsidiary in Lebanon and decided to pursue it:

> You have to be brave and you have to see an opportunity. You have to have the guts to take it. I mean maybe someone in my position at that time could have said, "why do I need this trip to Germany? I will stay here these two weeks and enjoy my summer". I had this target in mind of getting the German subsidiary to Lebanon, I wanted to do it. So, it needs guts. You need to seek opportunities, you need to have faith and take it, and you need to work a lot and teach yourself a lot.

> There is no other way. I went there. I was supposed to stay for a week, I stayed 6 or 7 weeks and I came back having translated their software to Arabic, and before going back, I negotiated representing them in Lebanon, which they accepted. (RAND)

Nonetheless, RAND also recognized that her constant pursuit for growth opportunities came at a price:

> That's the thing. That's one of my weaknesses. I don't allow myself the pleasure of enjoying an achievement before the next one is planned. I am working on that. I'm in a better position now, I have to admit. But for many years the moment something is achieved it is already behind me. I don't talk about it. I'm always looking for what is next. I refuse to celebrate what is done. (RAND)

Further, JANA reflected on her career journey and highlighted the importance of pursuing growth opportunities:

> I want to insist on a point that women in Lebanon shouldn't wait for the opportunity to come, they should pursue it– I know that from my own experience. Like I told you before, I've chosen my path, I've taken all the decisions and looked for different ways to grow. (JANA)

NOHA further reiterates the importance of pursuing opportunities in order to achieve career goals in STEM:

> What helped me reach my goal where I am right now is the fact that I jumped on every opportunity. I was exploring a lot. (NOHA)

On the other hand, LARA found a gap in technology initiatives at Lebanese school, mainly in the area of robotics and took the initiative to develop a school curriculum that included robotics classes:

> Robotics weren't famous in Lebanon yet. Even online. I used to go online, but I couldn't find anything interesting about robotics, no resources where available. Even in schools, there was no classes or clubs or anything. There were only some centers that did robotics classes, and still their offerings were very basic. So, I took the initiative and suggested to the school director that instead of the students taking two IT sessions, why not give them one IT session and one robotics session? The school immediately accepted my idea and the director was very excited for us to start with it. We were the first school to give robotics classes in Lebanon. (LARA)

For ZEINA, her realization that a gap exists in the entrepreneurship and tech space for women in Lebanon led her to co-found the IEEE:

> I started meeting and getting involved with people who wanted to make a change and to do things in the society that will attract women to technology and engineering and to expose them to technical skills. My research led me to get immersed in this space not just as a researcher but also as an active member who sought to expand the entrepreneurship and tech space for women. I found myself co-founding and becoming the chairperson of IEEE woman in engineering in Lebanon. (ZEINA)

For FIDA, her initiative to work in the technology field was a result of her dissatisfaction with her corporate job:

> I had a 9-5 job and the routine was killing me. I thought to myself that I can't continue like that anymore. I quit my job and I was interning at Zoomaal, which is a crowdfunding platform. After the first two weeks working at Zoomal, I got promoted to project manager. Suddenly the CEO gave me a paycheck, and he was like "you're now a project manager". I was very surprised! And then four months afterwards, I was head of the project management team. Through this experience, I grew a lot and I started thinking of my own business. (FIDA)

Commitment. In addition to the passion and initiative, the participants also demonstrated commitment towards pursuing STEM careers. Commitment here signifies the women's development of her personal career goals, the attachment to, identification with, and involvement in those goals. The women gave several examples with regards to their sense of commitment towards pursuing and while working in STEM fields. For example, RAND, a mechanic, recalled her diligence for growing her business:

> My days were fully booked. I would go to work and then come afterwards and start studying in business and management books. My annual leave, my sick leaves, my weekends were all dedicated to growing my business and for advancing in my work. When I went to Germany, I got another dealership for an amazing brand. No one believed I was that young (27) and I had these two main brands in the business. (RAND)

Similarly, RASHA explicitly discussed her commitment to her job regardless of her personal and emotional state:

> I think the internal one is my commitment and consistency. I'm just like a very consistent person, whether it's a good day personally or a bad day, I get the work done. And that is very important in my career. (RASHA)

More interestingly, REEM explained that the time and effort that her work requires heightened her sense of commitment and made her prioritize her work over any other personal endeavors:

> I will tell you straight out that I took a decision; I'm 34, I'm not married and I don't have children mainly because I think I cannot give this much. I feel that my business is a literal organism and it costs a lot of time and effort. I cannot put the same effort in another place. I cannot do it, regardless if it's right or wrong, this is the decision that I took. (REEM)

When reflecting on her personality, MAY noted that her commitment to her job stems from her approach for handling problems and challenges:

> I know that I am someone very perseverant and when I want something I would commit to it. The team always says there are no problems with MAY; there are only solutions. So, I'm really a solution oriented person. If there's a problem, I always try to find the way to handle it. And I don't lose hope. And again, this is probably in my personality and I have worked on nurturing it. It's not explicitly that I am thinking about being committed or solution oriented. It's who I am. (MAY)

Creativity. Creativity involves the combination of information and skills that an individual has, often in a unique and novel way, to approach a particular interest or issue. Some of the women discussed how their character and creative skills led them to choose a career in STEM as well as to face any problems that might arise. ZEINA shared:

> It is very dynamic. I think it was a very rough road, its untraditional, but as I said, that is what I love about the whole topic… It resembles my character. I am creative and cannot stay in the same thing for too long. Even now, I have been in the job for three years, I haven't been doing the same thing. My role is very creative you know, because it revolves around innovation and entrepreneurship, which is still very small, which is why I am very excited. (ZEINA)

As for NOHA and FIDA:

> I have this desire of learning on my own, of figuring out things. I think as a person, I get bored quickly so I try my best to look at things differently and to try be creative with my approach to solving technology related issues. I need to do that so I remain interested in the work itself or else I will have to find something else. (NOHA)

> I was never too comfortable in my job and that was a major motivation for me. All these challenges that happened at work, I know how to do address them now with my clients. I like to watch and analyze and be creative in my problem solving. I don't like to implement things that others have done, I want to be innovative. (FIDA)

The second property of the vocational choice category, is ***external influences***. External influences refer to the influence beyond the participant's control which either constrained or motivated their vocational choice. During the interviews, the women identified multiple individuals –both at home and at work– who had influenced their vocational choice in STEM as well as the influence of their international experiences and exposures. The women in this study understood that their career choices were intimately weaved with the relationships they had with others. In what follows, I will discuss the various external influences that the women shared; focusing on the family, the school, the manager, and the international experiences.

Family. Perhaps one of the most significant external influences affecting the vocation choice of my participants is the influence exerted by their family members. What is most evident is the closely-knit relationship the participants had with their *parents* and their influential role in relation to the women's career choices. For example, SHIREEN described the atmosphere at home as well as her excursions with her father to the construction sites:

> All my family members are engineers. My father is a civil engineer, so are my uncles and most of my cousins. They are all men. Everything around me had to do with construction sites. I used to go with my father to the construction sites and used to always observe what he was doing. I enjoyed it. (SHIREEN)

Further, REEM discussed how her parents challenged her to pursue a degree in engineering and how their work ethics influence her till today:

> I chose computer engineering mainly because my parents used to tell me to go into engineering and to challenge myself. My parents are literally workaholics. We come from a very structured home. I used to think that everyone was like that, that this is the norm of how people should work. And when I got in the work environment, I found out that this is not normal. My parents are going out of their way. My mom works from 7 am maybe till 11 pm, she's a teacher but she gives it her all. My dad is the same whether it's there is a war happening or anything else, work is the priority. I was raised this way. I'm very much inspired by them and very much taken by it. And I think this is the right way of working. (REEM)

RAND and NAY described the inspirational role their mothers had on their career choice:

> I would say it was always my mom. My mom is an amazing superwoman. Her positivity, her energy, the fact that she was running a municipality. When I was young, young men from the municipality used to come in the morning and I used to hear my mom speak to them. She was able to lead while also taking her of our family and of her mother. I mean she was a do-it-all person during the war period. And she was always positive. So, I always saw that energy and that automatically inspired me. And there is something about her. I always had this reassurance from mom that I can do it in engineering. (RAND)
>
> On a family level, my mom used to push me a lot and she strongly believes in a woman being independent. My mom lived during the Lebanese civil war and she wants us to be very independent and count on ourselves. My mom is a very

> strong woman anyway and she played a very big role in my career and my character. (NAY)

The women also discussed the influence of *other family members* on their career choice. MAY talked about the support and motivation that she received from her uncle to establish her own business:

> The person that I was a little bit inspired by to set up my own thing was my uncle, he was the one who pushed me. I've been in working for 7-8 years and my work started to become like a routine, although I was making very good money and had a very good position. My uncle told me that it's time for you to do something more than just work for others. When I look at it in retrospect, I always think that how could I have missed that from the start! My uncle had built his own construction company. So today he was the one that pushed, inspired and motivated me and then my dad supported me a lot along the way, a lot, and still does till today. (REEM)

For NOHA and JANA, their interest in computer science was a result of their own brother's influence:

> I think my interest in computers was because of my older brother. He used to get these games and gadgets to the house and I used to play with them. When he bought a computer, I was completely obsessed with working on it. (NOHA)
>
> I chose computer science because my brother majored in computer science and I had some curiosity about computers and how they work. I felt the passion that my brother had for his major and studies and I was influenced by it. (JANA)

For other women, the relationship with their parents sometimes took a different turn with regards to their career choice. For example, LEYLA noted that how discussions regarding her career didn't always occur in her household:

> I'm sure it's related to our upbringing. I mean my mom was the primary care giver at home and my dad was the one working, … Even though they are very open minded and I grew up in a very equitable household in terms of how they treated me and my siblings. But my role modeling was that: my mom who took care of the kids and my dad who went to work. He was very present when he was at home but it was a very traditional household and there were never those career discussions. They were never part of our growing up. (LEYLA)

As a result, LEYLA felt that her career pursuit in medicine was not really well thought of:

> Medicine was just a decision of momentum actually. I mean I was good at sciences. I did the science class and then, my dad is a physician. I started off as pre-med because I didn't have the time to think and explore anything else. So, it wasn't a very well thought of decision. (LEYLA)

For NADINE, her parent's desire for her to pursue a career in medicine conflicted with her own desire to pursue an engineering career:

> I didn't get much support from my parents; on the contrary, my parents wanted me to get into medical school. It was maybe one of the biggest fights that I had with them. (NADINE)

Similarly, REEM's attainment of an engineering degree was a sufficient achievement for her mother who believes that her daughter should now focus on other personal priorities:

> For my mom, it's a title, it's nice. You are an engineer, you gained your respect in society. But there are other things in life you should do like get married and have a family, to focus on other priorities (REEM).

For some of the women, the influence of their *spouses* played a major role in their career choice pursuit:

> My husband really pushed me to go for an interview at DOT. At that time, I was pregnant and I was studying for my MBA. I had a difficult pregnancy, but my husband kept on pushing me to go to the interview. After the interview, he told me, "Start the job, you can grow …. you are going to manage the organization. So, go for it". And back then, I had my kid. He was a premature baby, I was doing my MBA and I was launching the organization. So, of course, if I didn't have his support, his push to pursue it, I would probably haven't been here. But he believed in me and pushed me forward. (MAY)
>
> My husband pushed me a lot. He told me, "Your career first", and then you think about other stuff. (SHIREEN)

School. As discussed previously, the family had influenced the career choices of the participants and helped direct their interest in STEM. However, some of the women reflected on the absence of any career guidance at the school level. For example, RASHA shared:

> The career planning and counseling that happens at school today did not happen in my school. There was no career counseling. There was no exposure (RASHA).

For MAY, the lack of guidance at school resulted in her constant shifts in her major at the university level:

> First, there was a lack of orientation in my school. Back then, in 1996, the war ended, we used to live in a bubble, in a very closed community, we had very limited opportunities, guiding opportunities. And sometimes, when you are set on an idea, you think that this is what you want to do. So, I wanted to do landscaping. Since landscaping as a degree didn't exist back then in Lebanon, I thought my best option was to do agricultural engineering and then do my master's in landscaping. And then, during the course of my agricultural engineering degree, I discovered the food science field. And I decided to shift. (MAY)

For SAMAR, the school's insistence that science is the only way forward, made her question the importance of arts and then decided to follow a career in architecture:

> It was never nurtured, to be honest, we, especially our generation, there was never this attentiveness at school. On the contrary, at school we were always pushed towards the scientific disciplines, but never towards art, which I personally find very weird. Art is as important as science, so to me I graduated as a general science student with a focus on mathematics. It wasn't my passion, I liked math, but it wasn't my passion. But I was driven towards it because my

> school encouraged it a lot. It's not like I'm not into stem, but STEM also has an art side to it, like architecture, which I really liked and I did. (SAMAR)

On the other hand, RAND's interest in technology and in pursuing a career in technology was driven by her physics teacher while at school:

> My physics teacher was such an inspiration. I used to like how he taught us. I used to be so good in physics. And having this interest in doing things, seeing things grow or being built, it is more or less applied physics. So, I think at school, my interest in physics was nurtured. The teacher was good and I always had good grades. (RAND)

Manager. In their narrative, the women constantly referred to the influence of their managers on their careers. In retrospect, the women described their career choices as part of a larger narrative that took place between them and their managers. In most cases, the women's endeavors were supported by their direct managers who believed in their skills and knowledge. REEM explained that even though she did not believe in herself, her direct manager supported her to take on a new role in the company:

> My direct manager was the one who really believed in me. When he offered me the position to be an area manager, I had really limited experience. I was shocked and I told him if he was sure about it as I don't have much experience in the new post. My manager was the one who said, "No you can do it and I see it in you. And I've been looking for someone with your personality and engineering skills for a while". And he had to fight the senior management to accept me for that position…he was my ultimate supporter. (REEM)

As the managing director for a Canadian subsidiary in Lebanon, MAY discussed the importance of building relationships and trust with her manager:

> There are key people who support your mission. Be it my manager and my colleagues in Canada. The fact that you're by yourself, they believe in you and that they trust you gives you lots of motivation to push forward. I mean your hands are not tied. And you owe them because they trust you. For me, this is key to trust someone. (MAY)

For NADA, her manager's guidance and personal encouragement to further develop her career was key:

> When I got in Smart Six Association, my manager was practically my advisor. She helped me a lot; to think more clearly, to develop my skills. She showed me different ways in which I can achieve my goals. She gave me a lot of support and guidance. She doesn't tell you what to do. She makes you more aware. She asks you questions for you to critically think. She made me reach where I am now. (NADA)

Interestingly, RAND noted that her manager and colleagues influenced her own self-perception with regards to her career choice in technology:

> If you think about it, people play a huge role. Because they kind of show you what you don't know about yourself. And I was lucky to have these people. And I will always give them more credit than I give myself. That is for sure. Because they tap on something you have, which you would not have seen or you would

have overlooked. Their feedback all throughout my career and my own doubts, kept me moving forward. (RAND)

The narrative of NAY further shed light on the motivation that she drew from the feedback of her various managers:

> I always hear good feedback from people about me, from several project directors depending on what project I am working on. They all say you can do it, you are someone who can stay in the company and grow. It is motivating to know that I can develop my skills and further grow in my architecture career when I have their support. (NAY)

Similarly, SAMAR and NISREEN noted:

> I would give credit to my team leader, because he saw that I was a hard worker, and he supported that. And he always stimulated my mind and provoked my thinking. He was a good team leader. (SAMAR)
>
> There have been several occasions when I felt more empowered, more confident, and more appreciated. The dean at my university was a woman, so at least somebody out there understands how challenging it is to be in the place I'm in and she used to offer her constant support and encouragement. (NISREEN)

International exposure. For some of the women, the chance to travel and to be exposed to different ways of working, especially in the technology sector, influenced and cemented their career choice. A handful of the women participants had the chance to participate in Techwomen, a U.S. based program that aims to empower, connect and support the next generation of women leaders in STEM from Africa, Central and South

Asia, and the Middle East by providing them the access and opportunity needed to advance their careers. JANA discussed how profoundly her experience at Techwomen impacted her career and how she intended on giving back to her Lebanese community:

> To be honest when I participated in this program, I had no idea what mentorship is, what women empowerment is, and what a hackathon is. It was all new for me. My first event in Techwomen was in the Oracle headquarters in Silicon Valley. I met a really senior woman, which was new for me, and then we attended sessions that discuss women empowerment as well as career planning workshops that focused on how we are going to share our experience and give back to our communities. I was so eager to meet new people, so I downloaded an application that allowed me to check where the tech and pitching events are happening. (JANA)

SAMAR discussed her experience of interning at the Lawrence Berkley Lab:

> I interned at the Lawrence Berkley Lab where I was a researcher working on several projects. One of them is trying to design a unit that is testing the environmental conditions of the indoor air quality of the space. I was responsible for the design and production more or less in the fabrication unit. In parallel, it was more of an experience related to, say, leadership and how to improve your communication skills and develop your career. It was an eye opener. (SAMAR)

NADA talked about the impact that the international experience left on her:

> I applied for the Techwoman, and I got in. I went for about one month and a half. It was a totally new experience for me, and it was very important for my career

> because it was very empowering, especially for us middle-eastern women in the region. You are exposed to the new innovations in the technology field and you are aware of the major role that you can eventually play in your own society. (NADA)

Similar sentiments were expressed by JANA who noted that:

> I was selected as one of the top five emerging leaders in Lebanon to participate in the Techwoman program. I went and did an internship with Flurry in Silicon Valley for 30 days. We also had a lot of workshops and attended a lot of events related to technology and what the future of technology is going to look like. There were also discussions about the role of women in technology and in STEM in the middle east and how can we bridge the gap between education and the employment sector. So far, it's been a life changing experience for me. (JANA)

Category 2: Career Accomplishments

The second identified theoretical category is **Career Accomplishments.** Career Accomplishments refers to the women's own individual perception of their own career success and future career prospects. The women participants in this study reflected on their career experiences at large and discussed the various accomplishments that they have achieved while working in various STEM fields. The women discussed their accomplishments as they relate to a specific *performance,* their own *development,* the *recognition* they received from others for their work and the *impact* that they left on their surroundings.

Performance. When it comes to career accomplishments, the women reflected on their careers and particularly focused on examples that signify a performance related proud moment. For example, SAMAR discussed how successfully leading an important meeting at her engineering firm was a major accomplishment for her as a young architect:

> I always give this example. I was working on a project for 2 years at a large engineering firm, handling all of the requirements and implementation from the beginning to the end. I started it and I knew everything about it. At that time, I was barely 24 years old, which was very challenging for a woman working in such a large firm, consistently handling large scale projects. Back then I had to lead a team meeting for around 30 men engineers who are relatively older than me, but as an architect I knew I was one of the leads on this project and I was able to handle the 2-hour long meeting. It was a proud moment for me, I was young, and I didn't know all the answers to their questions but I was able to handle it well. I can say that it was both a challenging moment for me that led to my first proud career accomplishment. (SAMAR)

Further, for SHIREEN winning an architecture competition and working with a leading Lebanese architect was a major turning point for her career:

> The architecture competition that I and one of the most famous Lebanese architects won was a turning point for me. The competition was over a three-month period, and included architects from all around the world. We would work very long nights, I was executing the ideas that my partner was putting forward, I

> worked on them and of course I was adding my own touches, my personality was in the plans. I worked a lot for it, I would wake up very early to plan, draw and print my work. I did everything. And when we won the competition, my partner, who has one of the most recognized architecture offices in Europe, told me that *I* won the competition. He appreciated all of my hard work. He would take me to all the meeting, I was there on-site all the time. I also presented that project in front of the international jury, I was very involved. This was very important to me. (SHIREEN)

Similarly, REEM and ZEINA both expressed their accomplishment sentiments for starting their own business:

> In retrospect, one of my major accomplishments is building this company from scratch, building something that works and is useful to people, to my clients and to my community. Since my business rests on optimizing delivery services, I know I need to have trustworthy employees and I am always surprised when I prepare the payroll at the end of every month and I see how fast we are growing and the increase in the number of our employees, mainly in the delivery team. For me, when I'm on the street and I see the drivers on the road that's a very proud moment for me, when we get positive reviews from clients, I save them and I share them with the team. This makes me very proud like we've built this basically. (REEM)

> When I started my own business in the technology sector, it was something very important, especially since both my parents and my in-laws didn't have an

> entrepreneurial mind set. My mum and my mother in-law both work in the government and my father-in-law is in the army. So, we simply didn't have it in our family or culture. I am proud that I turned out to be an entrepreneur, and that I started my own business. I am also proud that in the last few years, I was invited to conferences in the US and other places that were mostly financed by external entities. I was proud that I could get this international exposure and benefit from it. I am now more well-rounded because of my global exposure. (ZEINA)

For RASHA and RAND, the notion of starting something new and for sealing a new deal was very important for these two women who expressed proud sentiments of their work:

> Well, I think our graduates. That was a proud moment. We started the first emergency medicine training program in Lebanon. So, the first EM specialists came out of our efforts. I mean, the program that we established when I became chair. So, it's always a proud moment seeing, even though I am not very excited about teaching myself but I like having established that program and seeing people move on and specialists, clinicians move on to great career paths. (RASHA)

> To think about it, when I went to Iraq and got the first big deal with the inspection centers. This was very important to me. Also, when I think about it now, having the guts to start this subsidiary in Dubai while I am operating out of

> Beirut. The whole experience for me makes me aware that I can do things beyond my imagination. (RAND)

Development. The narrative of the women referred to their own personal growth and development as a result of their work experiences and highlighted the importance of continuously developing one's skills and knowledge. These were considered examples of career achievements as they relate to the women's own career development. LAMA discussed:

> When I started working in the family business, I had to implement a re-engineering process to check out how efficient the whole system was. I knew I had to attend trainings, read, and conduct needs analysis. So, I started doing all that. Being in a decision-making position and responsible for almost 200 employees is not easy. I have to be very careful with my direction and recommendations. Knowing all that, I knew that I need to continuously develop myself because it's a big responsibility and it's the livelihood of the whole family. So, for me developing myself and the company and making sure we are working in the most efficient way, is very rewarding (LAMA).

In the same vein, MAY discussed how her decision to shift her career early on allowed her to develop her interest in technology and to achieve her desired career goals:

> I think the decision to shift my career is something I am very proud of. Shifting from agricultural engineering to the food science sphere and then to technology had taught me a lot. I develop my skills in perseverance, patience and commitment. But, I think the best move was the moment that decided to have a

> career shift. I didn't wait for like 10 years and then said "OK, this is not what I want, I really want to be in the technology and humanitarian field". I took the decision from the first day. Because probably, if I had worked in the food industry, I wouldn't have dared to change. I would be in a comfort zone, and I probably would have regretted it. (MAY)

While for AMAL, her work to develop a university degree in STEM and adding it to the curriculum was a major career accomplishment:

> Three years ago, I developed a degree emphasis in my department; a Master's in STEM education. A stand-alone degree that wasn't previously offered at our university. I consider this as an achievement, because I know that we need to have educators in STEM, to increase the awareness of its importance. Also, no other university in our region offers such a program. I am very proud that I have developed it and I am teaching in it as well. (AMAL)

Further, AMAL reflects on her early career as a faculty member in mathematics and notes that one of her major achievements was being able to secure a faculty position in one of the most prestigious universities in Lebanon:

> I came to the university with many less chances than others. I didn't study or graduate from it, so I wasn't actually part of that community. But I was able to breakthrough and get the faculty position. Believe me, when I started I didn't know anyone. I simply went to the university, and I started asking where the Department of Education is, and I asked who is the chair and the dean. I knocked

> on their doors and I was able to meet with dean and I started chatting with him, and he told me to apply and I was taken from there. (AMAL)

Recognition. For some of the women, being recognized for their work and being sought after for their skills was a major career accomplishment. For example, NOHA talked about how building her reputation as a subject matter expert in the UX technology field and having a strong referral network, made her more confident in her decision to work as a freelancer:

> I'm going to tell you a recent thing that happened to me which made me realized that it was an achievement. Someone reached out to me and was asking for recommendations with whom should he work when it comes to UX and he said that 8 random people referred him to me. You know when I left a steady job and started freelancing, I wanted to create a name for myself. That was the moment that I realized I reached that stage and I built my reputation. It's like now I have credibility and I know that my clients are satisfied with my work and are now recommending me! So how do you know that you have done a good job, it's when you hear this because there is nothing else that can tell you. As a freelancer, you don't get a salary or performance appraisal. You cannot become a senior freelancer. It is all about the feedback. That was the moment I was happy to have established this reputation and that I am delivering quality results to people. (NOHA)

In the same vein, DIMA discussed how client satisfaction for her work was highly appreciated:

> A proud moment for me is when you see that you have accomplished your job, when you see the end product and when you know the client is very satisfied with your work. Also, the other day, I had a conference call, and the client was telling his team that they are now in good hands, because I am the architect on this project, and I am qualified. (DIMA)

While for RAND, being recognized and respected for her contribution as a woman in technology was a worthy accomplishment:

> Recently I was featured as the youngest female MD to head a German subsidiary and I was also very lucky to be selected by AUB to be one of the 80 or 90 women in the history of AUB who were selected to be part of a book called 'For all conditions of men, stories of women' at AUB. The book is new. It came out a month ago and it discusses the accomplishments of women who graduated from AUB. I was very honored to be one of those women who is trying to make a difference. (RAND)

Similarly, LEYLA discussed how a major proud moment for her was once she was recognized by her alma matter for her work and achievements in the medical field:

> Other proud moment is going back to John Hopkins and them recognizing me and feeling proud of having a graduate who is now one of the first female chairs of an emergency department at a hospital in Lebanon. Actually, the first female graduate from John Hopkins, to take this position. So, that was also a major accomplishment. (LEYLA)

Further, one of the greatest achievement for LAMA was the validation of her work and practices from an external consultant:

> My biggest achievement was when, as a company, we decided to hire an external consultant to audit our firm's practices and his report confirmed all the things and practices that I have been pushing for. To me it was amazing, I mean I was young, I had never done this kind of change management in another company. But based on my, if you want, way of thinking, and my readings, I was able to take the right decisions in the right time. This situation validated in a way what I was planning for. It gave me lots of self-confidence, and I was very proud. (LAMA)

Impact. Another accomplishment that the participants discussed was the impact that they had on others through their work. Here, impact denotes the extent to which the participant where able to make a difference in the lives of the people around them through their work. For example, MAY shared how through her work in the technology field she can contribute to the development of the rural communities in Lebanon:

> I took the lead to open the organization's subsidiary in Lebanon back in 2010. I started it all by myself. We now have a budget of 2 million dollars and employ 25 full-time employees. We are having a very big impact on the rural communities in Lebanon, with a lot of success stories that are shared by our beneficiaries. We mainly focus on technology outreach, technology awareness, and building technology skills to the most deprived population. I can see that I

> am leaving an impact on a lot of communities and this is a major proud moment for me. (MAY)

In the same technology sector, ZEINA discussed the impact that her organization had on the youth and how it empowered them to learn new skills:

> Working in the technology and entrepreneurship sector, I always feel very rewarded because I am always working with the youth. The youth have this energy to learn and even to adapt to change and in the technology field, these two things are constant. Through my work, I try to teach coding skills and I try to create an environment of constant learning. I think this is where you leave the biggest impact. When you can equip someone with a skill that they can use to get better employment opportunities, you know you are making a difference. (ZEINA)

Similarly, FIDA shared how in her moments of despair and questioning, messages from her co-workers and others regarding her impact on their lives changed her view towards work:

> I have those days where I just think I want to quit. That I will go back to a 9-5 job. But then I get these messages from people who follow my work and they say things like “I am very proud of the work that you have done, you make me want to be the same”. “Because of you and what you taught me, I have a good job now and a different outlook on life”, or “I have changed my field after reading about you”. At these moments, I just think that I need to continue my work in my startup because even if I don’t see it, I am leaving a positive trace behind. (FIDA)

Further, LARA shared how through her work in robotics she is able to inspire girls to consider a career in technology:

> My main focus is on girls in grade 6. I do my best to show them how important and interesting robotics can be. I always try to make it a point that the aim behind studying robotics is to allow you to think differently and to gain lifelong skills such as critical thinking. I think that in my position as an educator, I can really inspire the future generation of girls to pursue a career that is different and that is challenging so they can to contribute to their societies. (LARA)

Similarly, SHIREEN discussed how she tries to encourage her employees to think differently:

> For me, I think that I impact how my team thinks or approaches problems at work. I always ask them "what are the problems that you want to solve next". In this way, I want them to be more solution oriented and to think outside the box. I think with my style I am influencing how they look and approach work. (SHIREEN)

On a more personal level, ZEINA discussed the impact she is leaving on her children being a working mother. She shared:

> Even though it is challenging balancing the requirements of both the home and the work, I truly feel that I am giving a lot for my children because I work. I feel like I have an influence on them, being a working mother who travels and runs her own company. My daughter and my son they both discuss my company and the idea of entrepreneurship with their friends at school. My daughter even says

she wants to work for my company one day. So, I can see the influence I am leaving. They are more independent now. I try to give them the right tools to succeed and I encourage them all the time. (ZEINA)

Category 3: Career Challenges

The third category gives insight into the **career challenges** that women in STEM fields in Lebanon face across multiple level of analysis. Here, career challenges refer to the various barriers that hinder the career progression of women in STEM. The women's interview narrative and subsequent analysis shed the light on a number of challenges that the women identified to impact their careers. Primarily and most notably are the challenges that they faced at the *institutional context*, including organizational level barriers as well as constraining cultural and legal practices. Other properties of this category include a discussion about the *scarcity of resources* as some women had faced difficulty in securing the financial support needed to grow a business, specifically in the technology sector. Further, scarcity of career guidance efforts was also seen as by the women as potential impediments for their long-term career progression, highlighting the absence of formal mentorship in their organizations. More interestingly, the women's narratives highlighted various *gender stereotypes* both at work and at home that further constrained their careers. In what follows, I will discuss these challenges in further details.

Institutional Context A major career challenge that could be identified from the women's interviews relates to various systems in the institutional context. The institutional context here is thought of as the environment in which various institutional

forces are embedded in a dynamic system of interrelated organizational, cultural and legal processes. In what follows, I will give more details regarding the challenges the women faced at the organizational, cultural, and legal system level.

Organizational System. The organizational system in this study refers to the organizational structure, design, and culture that work together to create an unhospitable working environment for women in STEM in Lebanon. The women discussed in great details the various impediments that they faced as a result of the organizational system in which their careers were embedded. From the discussion with the women, the organizational systems can be seen as gendered as they perpetuate gender norms with regards to STEM employees. Based on the interviews, the women discussed a *gendered organizational culture* that remains grounded in beliefs and values that men are more suitable for STEM positions and that women are mainly present at the periphery. As an engineer, NAY discussed how particular tasks are viewed to be either suitable for men or for women:

> Like what I see within the company, all the senior positions are occupied by men. You can feel that they interact differently with the men employees than they do with the women. You feel for example if there is something, which I know I can deal with on-site, the men are always preferred and chosen to do the task. For senior management, in their mind, I am a woman and I should be in the office working on the more technical stuff and drawings, and not on-site. (NAY)

This is further translated and made more explicit while she was working on site:

> I remember there was this one time when I was the only female working on a project along with other foremen, and the subcontractor walks into the site and he greets the foreman and asks for the engineer on site. Although I was standing next to the foreman, the subcontractor didn't think I was the engineer! He was expecting a man! (NAY)

NAY further explains how her opinion and expertise comes second to her male colleague. Highlighting in turn the gendered organizational culture that she has to deal with as a woman engineer:

> Another example there is an engineer, this one guy, he is you could say the right hand of the project director and is only one year older than me. We both work closely with each other and have relatively similar tasks. However, whenever the project director seeks our opinion, he listens to my male colleague more than he does to me. Whenever there is an issue that we both know about, the project director will still give more attention to him. You can feel it, it's an unspoken topic. (NAY)

Further, as a chairperson of the clinical specialty in one of the largest medical centers in Lebanon, RASHA discusses how one of her team members bluntly connected leadership to an idealized masculine worker. RASHA then goes into further details to explain how gendered organizational structures still infiltrate the medical practice as a whole and how the lack of understanding regarding gender issues is still present at the highest level of the institution:

So, we look at the list and the first four, the top four are women. So, one of the men faculty in the group says “wait a second, we are introducing a new specialty to the country. And we want leaders. People who are going to make changes at the international level and there are four women at the top, how can that be”. Can you imagine that this conversation happened? I have young faculty, relatively progressive and I am the chair. I’m the chair that supported a new structure, built the structure that made it possible to attract and hire more women. But this is the culture that we are in, there are a lot of gender biases in committees and other decision- making bodies that are happening and are not being checked. If this has happened in my department when it’s likely one of the most progressive department I would say in the faculty of medicine. Imagine what is happening in other places. (RASHA)

I am also in the university senate and we were discussing salary discrepancies between men and women faculty. The whole discussion was that we need to move forward with women and women’s issues, and then the provost says: “but wait a second. The salaries of female faculty and the discrepancies are because women don’t negotiate”. So, your leadership doesn’t even understand the full extent of the issues, that it is not just about negotiations, it’s about so many other things, that it’s embedded institutionally. Yes, maybe part of it is not the negotiation but there are gender gaps. In certain faculties, more than others. Some like engineering, it was adjusted a couple of years ago. Faculty of medicine, we haven’t looked at it and it’s harder to look at the faculty of

> medicine because it's still fee for service. So, when you are looking at salary discrepancies, it's a bit harder to … but we need to do it. (RASHA)

The intuitional structure highlights various career challenges that women doctors face at both the faculty level as well as the at university level as a whole. The system as RASHA explains is unfavorable for women physicians. This idea is further reiterated by ZEINA, an engineering faculty and the founder of a social innovation start-up that offers education programs and services to foster social entrepreneurship in Lebanon, who discussed how a traditional view of the male breadwinner by her department's chair resulted in her losing the opportunity to teach a summer course:

> Once I was asking my co-PI why is the chair bothered by me. And my co-PI tells me: because you're a woman. I looked at him very surprised! And he answers me that in the engineering department they are very biased. I recalled a time when the chair didn't give me a summer course, noting that I have been teaching that course for the past three summers…He told me that he considers the summer semesters as a bonus payment and he prefers to give that course to someone who really needs it; financially. Specifically, he wanted to give it to my male colleagues who has a family, although he also knows that I have a family too. He might have thought that since my husband works that I don't need it financially. While the other guy is the main financial provider for his family. I felt very depressed and discriminated at. (ZEINA)

Further, NADA, a committee chair for Smart Cities Association explains how one of her work partners frowned upon women holding leadership and decision making positions:

> During that year and a half, we had a third partner. I can't tell you about his attitude. I was a member of the three-people management team. The first business partner that I had was very open-minded and had international experience; however, when she left another partner came who wouldn't accept women's opinion or propositions. He just wanted to do everything his way. For him, it was totally unacceptable for a woman to talk and share her opinion and be in decision making positions. He would always say that "Okay we listened to your opinion, but in the end, I will make the decision" and indirectly, he was telling the third partner: "She is a woman, her opinion can't be put on the same level as ours". (NADA)

This explicit gender discrimination was an organizational element that went unchecked that further made clear the deeply rooted presence of a gendered organizational system. RAND explains that although she was asked to observe the installation of the inspection center, the director made it clear that her chances of joining a team were very limited as they normally don't hire women as mechanical engineers:

> The director of the center called me saying that the German team is coming to install the equipment for the inspection centers in Lebanon and asked if I would like to join the team to see what's going on. So, I agreed and I went there. I knocked on the door and the director directly told me "we are building the team now who will be working on these equipment, they are all males, you won't make it, we never had women work in the mechanical department here…". (RAND)

In addition to the prevalence of a gendered organizational system, the women discussed the institutional challenges with respect to attaining a *work-life balance*. For instance, LEYLA explained how in the faculty of medicine, which is largely male dominated, the line between work and family time is very vague and that it is difficult to manage it:

> I think a specific other, related to gender is the work/life balance, especially in the faculty of medicine where it's around 25% at best, of the faculty are women, maybe even less, the work culture is still very much set by men who have full time wives supporting them at home. So, whether it's task forces, meeting times, committee meeting times, phone calls on non-urgent issues, there is no limits, there are no boundaries. So, this is partly male dominated culture, partly also Lebanese culture. There are no boundaries about when you can call about work, whether it's a priority or not a priority, someone will pick up the phone and call you on a Saturday morning because something popped up in their head and they needed an answer to it. So, I think managing that was definitely a big challenge. (LEYLA)

To this point, MAY further explains how as a managing director for DOT, she realized how the technology industry is mostly designed for men and lacks flexible work engagements and other means that can help working mothers further their careers:

> At least in Lebanon, when it comes to career growth as a woman in STEM there are a lot of challenges because it's a male dominated industry, it's very competitive, and because there is an expectation for the working mother to successfully juggle between her professional and personal life. This is then

> related to the absence of a flexible work environments, as a performance system that still revolves around face time and in-office availability instead of it being more should delivery base. (MAY)

This is in line with the sentiments shared by AMAL who wasn't able to achieve tenure at her academic institution primarily due to her being a woman and the lack of support for her role as a mother as well the centrality of decision making in the hands of men:

> I didn't get tenured and I decided to leave that university. I think that not getting promoted had to do with me being a woman. The support system at the university back then was absent for a woman. I had two babies during my time there, so naturally my research output was not optimal but I was still producing more than other colleagues at the college. Also, my tenure file was mainly reviewed by men who didn't understand what it means to raise children at the same time that you are supposed to publish. (AMAL)

Further challenges the women discussed at the organizational level gave way to examples of *harassment* and an infringement on the women's own *personal life* and childbearing decisions:

> There are challenges being a woman and one of the main challenges is that they will try. They will try to blackmail you, to use business as a way to get to you. That happened a lot. There were occasions where I wondered what to tell my brother when the 10% wouldn't get paid. Should I tell him I didn't sleep with the guy? What should I tell him? It's hard. (RAND)

> When I was working on the construction site, the project manager from the client's side once approached me and told me that he prefers that I stop going to the construction site because the workers are being distracted with my presence there. (SHIREEN)

The above two examples highlight the implicit harassment that some of the women had to deal with while at work. Reflecting in turn the institutional structure that tolerates this kind of behavior. Further, some of the women gave examples on how their managers view married women to be of high risk that would cause work interruption: NOHA explains:

> There was this situation where I was being interviewed for a job, and the male interviewer asks me "are you planning on getting married any time soon?". In another instance, when I was already working and we were hiring a new developer, whenever I would share an application with my manager, he used to ask me "is she recently married? might she have kids soon?". So, these incidents still happen. (NOHA)

This is further explained by JANA and NADINE who discussed how their career pursuit was hinged on them being women and how that ultimately affected the recruitment decisions:

> I got an opportunity to be a branch manager for a company in Lebanon. The position required a lot of traveling which I was ok with. However, the senior management refused to hire me because I am woman and I might get married and

> have children which might affect my work. Especially since I will have to take maternity leave and be away from work. How absurd is that! (JANA)
>
> My manager once told me that when I first applied to the job, one of the main parties who is the CEO, had a concern that I am a woman, and his comment was: she'll get married and she'll quit, and we need someone who is flexible, who can travel and meet clients and get the work done. (NADINE)

Whether it's issues of harassment or being viewed as a high-risk hire, the women's challenges were myriad and all reflected an organizational system that wasn't necessarily ready to promote women's career growth in STEM fields in Lebanon. One last element the women discussed as part of institutional challenges was the *bureaucracy* they encountered at their organizations. SAMAR, an architect and a senior lecturer at BAU, explains how the bureaucracy in her academic institution limits and curbs her imagination for work. In addition, she discussed a particularly hostile environment that fails to acknowledge her efforts:

> In BAU, I think it's an institutional thing in academia, they have a bureaucratic structure that is very rigid. It took them time to believe in what I do, and to believe that I can actually do it. I still believe the bureaucracy is a big challenge for me because it's very limiting to my enthusiasm, it always limits you. Also, the fact that no one acknowledges your work and they try to take credit for what you have done is very frustrating. They have attacked my work, I think mainly because they feel threatened by me because I am cheerful and enthusiastic and I have a wide network especially with people in industry. So, they know I have

> some power, I am leading this engineering lab, so instead of nourishing my skills they attack me. It is just a hostile environment. (SAMAR)

Similar thoughts were also shared by NISREEN, an associate professor in computer science and mathematics who also felt that her academic institution and particularly her colleagues weren't supportive of her work:

> There have always been issues at the departmental level. I can just say that it wasn't by large, it wasn't a very friendly place to be at. For support, it wasn't supportive. I hardly felt appreciated, I hardly felt as a member of the department. It was probably my own projection onto my colleagues, onto the majority of colleagues with a few exceptions whom I can definitely single out saying they weren't supportive in the very least bit. (NISREEN)

From another perspective, REEM, an engineer discussed how the bureaucracy at her workplace limited her ability and participation in the establishment of her team:

> There is the other part that is a major issue that I used to face when I was employed is that I was restricted to the team that I was working with. I didn't have any say in the hiring and firing decisions. I would recommend but the company didn't listen, so I had to live with that situation. This was a very big issue because I really believe that the team is the heart of the operation. I just had to face the conditions. It wasn't easy at all. (REEM)

Further for RASHA, who is a medical doctor, the institutional system had some nepotistic features that in some ways worked on alienating her. She went into details to discuss how networks and decision making were built based on that nepotism:

> I think in general, it's a challenging environment especially since I wasn't part of the institution previously, meaning, the university is a very nepotistic place. Almost everybody, I would say like 80% of people have had some part of either their training, undergraduate or graduate study in it. So, you are seen as an outsider, forget about the gender issue but even as a non-graduate from it, there are challenges. Because there is a very strong network that already exists between the university graduates to begin with that you don't understand, and the decisions, meaning a lot of the decisions are being made amongst the network of very close colleagues and friends and those relationships are really invisible to you. At this level, I am feeling it more. When you come in as a junior person and you are working primarily on your clinical work, and taking care of patients and on your research, you are working in silence. But as you advance and have to work across departments, across people, across different faculties, then, it becomes actually more prominent. I think it's one of the big challenges. Just navigating through the internal politics and just the already very entrenched relationships that exist. (RASHA)

Culture System. In this study, the culture system refers to the Lebanese cultural context that the Lebanese women both are present in and interact with. The idea of a cultural system as part of a larger institutional context explains the widely-shared attitudes, beliefs, and behaviors regarding a specific topic that are deemed to be socially and culturally acceptable. This system was translated by the women's own experience with the larger culture context in which they are situated. For example, both NISREEN

and LEYLA discussed the patriarchal nature of the Lebanese society and how it affects their own perception of their gender role:

> I mean even us females, we are sort of engineered to think that we should be the one doing all the household planning, we should be the one giving our kids a bath, helping them in their homework, driving them to activities, doctors, taking them to birthdays. So, I wouldn't even accept it differently. I wouldn't think I'd like to stay in office while my daughter has a swimming class that my husband can take her to. So, we're both. It's really so cultural and sort of a mission impossible probably unless we – which is not highly likely to happen – the institution, the academic institution evolves to accept or accommodate this. (NISREEN)

LEYLA goes on to discuss how the traditional division of the household duties is still prevalent in Lebanon while also expressing the irony that exist at the organizational level that expects both men and women to commit the same time and energy to their work:

> Patriarchal and also, it is still mainly the traditional household division of labor where the man is working outside – at work, and the woman is working at home and then, add to it a work environment that, in general hasn't, no one has been challenging it to change. So, the expectations of both men and women at work is that you are available a 100% of your time and 90% of your time is really for serving the institution, without realizing the toll the culture puts on you as a woman. (LEYLA)

Along the same lines, LAMA also referred to the unconscious bias that is present in the Lebanese society that influences how women are viewed and treated while on the job:

> Another challenge is the society itself, the men, and the unconscious bias. This is very important, because the unconscious bias in our society maybe, and in the whole world, affect a lot how we work. I've heard a lot of times men telling me "I took care of it, it's not a job for women", and I would reply "I am the manager here, I'm the owner, you can't do something like that", he would then reply "no, no, this is not a job for women". He thinks he's protecting me from a tough job. His bias towards me is making him act on his own terms. (LAMA)

That same bias had an influence on ZEINA who sought an occupation that would align with her role as a woman and a mother and one that is deemed suitable by the society. ZEINA pursued a career in teaching while developing her own social enterprise on the side:

> I don't think I had the intention to teach at first. Flexibility I think was a major factor for me to pursue a teaching job. Here in Lebanon, as an engineer with a master's degree, the job opportunities are limited if you don't want to work in industry or in a 9 to 5 jobs. So, my other option was mainly to teach, I thought to myself teaching is good and it has a good reputation especially teaching at a university level. So, from a social perspective, it was acceptable for me to move from my industry job to a more education oriented job. In Lebanon, being a teacher for a woman is highly regarded and people tend to accept it more than if I was working in industry. (ZEINA)

Further, NOHA, who is a user experience and digital strategy consultant explains, how her status as a "free-lancer" wasn't directly accepted in Lebanon. She noted how the culture values job security and safety above career risks:

> It's also the culture in Lebanon, the idea that you need to have a stable job. People, even my parents don't understand what I do. What is freelance? How do you live? How can you live not knowing from where your monthly salary is going to come? (NOHA)

This cultural notion that infuses job safety is further explained by NADA, who as an engineer realized the career growth in Lebanese organizations is very tough and practically unattainable. A realization that led her to quit her steady job and pursue an entrepreneurial path:

> When you see the culture in Lebanon, it tells you that you have to grow up slowly, to prove yourself, to a point you believe that this is the current situation and you can't change it. Same company, same people, and you can't move forward because your boss will be in their position for a long time. Also, you need to take into account the preferential treatment and Wasta that exist in Lebanon. (NADA)

Following suite, MAY expressed how the Lebanese culture view work in the humanitarian sector. As a managing director for DOT, MAY notes:

> Now, working in the humanitarian field someone has to be really ready for it. Because, especially in Lebanon, you are labeled as someone who is a volunteer, someone who is a social worker… You're not labeled as a professional person

> who works in an organization that has business processes in place, that is accountable to stakeholders, but at the same time it's a not for profit. So, in Lebanon, they lack this awareness. So, they don't consider you as a professional. They label you more as a woman who is trying to spend her time. So, this is a challenge by itself. So, someone has to be really ready to face the society. Now, the people who are in this field are very much aware of the level of professionalism, competence needed, skills needed because they are here. But I'm talking about the private sector. So, this is a challenge for someone who works in the humanitarian field. (MAY)

She further explains how the societal culture at large had infiltrated her organization and has caused some disturbance with the employees:

> It is something very important that in Lebanon, not everyone can work in certain organizational cultures. I'll give you an example. We have trainers scattered across Lebanon and we have complete trust in them. We don't micro manage and we give them the autonomy to do their own work. Unfortunately, we had to fire people because they abused the system, our transparency and trust. They couldn't work in our organizational culture. They weren't used to it in Lebanon yet. They are mostly used to people constantly observing them, checking what time they come in to work and what time they leave. In Lebanon, the employer doesn't trust the employee directly and vice versa. We tried to be different but some people couldn't accommodate us. (MAY)

Legal System. In this study, several women discussed the legal system in Lebanon as one major challenge that restricted their entrepreneurial activities and creation of their business. Particularly women entrepreneurs discussed the difficulty in understanding the legal processes that they need to follow to establish their businesses. For example, REEM, the managing partner of an engineering start-up explained:

> First of all, when we set up the company, we had the worst legal advice ever, we set up the wrong type of company because the lawyer didn't ask the right question and I didn't know have the legal knowledge or expertise to know what to ask. The legal system in Lebanon is complicated for people who want to start a small business. This was my experience. There a lot of bumps along the way especially when it comes to tax issues. I think not knowing a lot about the system put me at a disadvantage. (REEM)

Further, both SAMAR and NOHA highlighted how the legal system was biased towards small business enterprises and was mostly designed for large corporations:

> The legal infrastructure in Lebanon is a mess. The system is designed for big enterprises and not for SMEs. Although if you know the majority of businesses in Lebanon are SMEs! I will tell you what happened to me. So, once we started our business, it was only me and my partner taking on the jobs. After we started getting more work, we hired couple of employees and registered them, mainly for tax and NSSF purposes. So, once we had a visit from a representative of the NSSF and he checked our books and noticed that we were making revenue in the first year but we didn't have any employees registered. So, he thought we were

> lying because he wouldn't believe that it was the work done by my partner and I! So, he fined us!! We had to pay that fine for almost a year! (SAMAR)
>
> For entrepreneurs, it is very tough operating and setting up your business in Lebanon. First as a woman, the representatives from the government don't take you seriously. Second, the rules are very vague so you end up having to hire a lawyer to guide you through all of it, which is expensive for an early business. The system I would say is biased towards organizations who have legal advisors that know how to work around it and not for people like me who are relatively small. (NOHA)

Resource Scarcity Another challenge the women faced can be illustrated as a resource scarcity. The two (i.e. finance and human) are considered by the women to be scarce resources that add further impediments to their career development. The women discussed the challenge in securing financial support to start their own businesses as well as the lack of career guidance that they had to endure in their organizations.

Financial Support. The lack of access to financial capital was a significant disadvantage for some of the women who sought to grow their careers or to start their own business. Several women discussed the difficulty and challenge in securing the right investment and getting the needed financial support to launch their business. Undoubtedly, for REEM inadequate access to financial resources was cited as a primary challenge for her business growth, specifically when it comes to issues of recruitment and team expansion:

> From the beginning, we are working with small funds while being in growth mode. Although slowly. This means that we cannot hire as much as we need at all times so our team is stretched to the maximum and our team members wear different hats. For example, if you are a brand owner today at many times you will be supporting in sales and in marketing activities. As a startup, this is ok for the first couple of years but this is not sustainable as we grow. So, the lack of funds really has an effect on how you work and what roles will your employees be holding. Even though, this is a challenge that keeps me motivated. (REEM)

Further, SAMAR discusses the pre-mature investment climate in Lebanon and the sentiments of turning to other sources for securing financial investments:

> So, in Lebanon, the incubator and angel investor scene is starting to pick up but it's still at its early stages. So, as entrepreneurs we always face the challenge of raising funds to secure our sustainability. This is the real dilemma. You have the ideas and you have the knowledge and expertise but you lack the money. So, I remember I had to find different ways to secure my funding. (SAMAR)

Despite the financial challenges, both REEM and FIDA turned to other forms of investments in order to secure funding for their startup and keep on moving forward:

> When we started, we started with a limited investment basically and as a company we are not one of the cool tech companies that make something that is out of the norm, which you can pitch easily to a VC, it was not like that at all. We bootstrap for a very long time and we got on board angel investors but all that process was hectic along the way. (REEM)

> Mainly financial, as far as I'm concerned, it was financial challenges at all times, it's about sustaining yourself, in order to keep going. So, you search for other ways, not only traditional bank loans. That is not enough. (FIDA)

Other than the financial means needed to start and operate a business, other women discussed the lack of funding at the institutional level and how does that affect their career growth. As an associate professor of computer science, NISREEN discusses her university's expectations for producing high quality research with minimal funding:

> I mean doing science in the Middle East is already difficult enough. The fact that we don't have the same amount of funding or the machinery that I need while working in the computer science field. So, you need to work using extremely minimal resources. And yet at the same time you are expected to be producing international level material and publication, which is totally unfair. We need financial support, we apply for grants to get support but we often have to face overhead cost and then end up with a small fund that will not sustain our research. We need to have more support for our scientific endeavors that are long term oriented. (NISREEN)

From the experience of a medical profession, RASHA discusses how high operating cost in the medical field restricts her budget to offer incentives and pay increases for her staff:

> In the medical field, our operating cost is very high and since we are part of the university medical center, funding is highly centralized, especially for human capital. Let's say I want to give one of my staff members a raise or even some

> sort of monetary incentive, the system is very rigid and takes time and in some cases I end up losing talent for other competitors or simply losing my staff's engagement and motivation. (RASHA)

For MAY, who works in the humanitarian sector and manages a non-profit organization, securing funding is crucial for her company's survival:

> We're a nonprofit. So, typically a nonprofit, raising fund is a big challenge especially that we're not a relief organization, we don't distribute blankets and food and heaters. People are not sensitive enough for the technology and entrepreneurship field. In Lebanon, they are not so aware about this concept. So normally we don't attract directly private funds. (MAY)

She goes on explaining how the lack of understanding towards the service that her organization offers is a challenge by itself. Discussing sentiments of lack of appreciation to technology and the importance of being technologically savvy in Lebanon:

> The product or actually the service that we are offering is a challenge by itself. To have people understand the need for technology education, the need for building future generations to enhance the local economy, to provide more educational opportunities and to increase the livelihood opportunities. So, the topic is challenging which results in challenges for fundraising activities and subsequent business sustainability. Sustaining the business is a roller coaster. For the past 2 years, we have had a budget of 2 million dollars. But back in 2015, due to budget cuts and the lack of financial support, some of our employees had to

work part-time for a while because we had no funds. So that is the reality that we need to deal with (MAY).

Career Guidance. Factors affecting the career experiences of women in STEM fields in Lebanon can also be represented by the lack of proper career guidance that the women can leverage to advance their careers. Once such example is the lack of mentoring opportunities for women. Issues relating to the lack of mentorship and adequate career guidance were discussed by the women as major impediments for their career growth. SAMAR shares her thoughts regarding this issue:

> Another challenge that I face, is that I don't have any mentor or someone I actually trust and can help me direct my career. When I was working at a large engineering company there were a few people whom you can ask for an advice, but it wasn't something that was designed by the company. And now maybe because I am in an academic institution, the structure is different, it's as if you are expected to do everything on your own, even as a junior faculty. (SAMAR)

These thoughts also reflect ZEINA sentiments, especially with respect to the importance of having a mentor to guide you while you are starting your own business:

> To be honest, I think that we lacking the concept and the value added of having a mentor. In Lebanon, it is done very informally. So, imagine if you are starting your own business and you don't have a mentor. It is very tough! I did a lot of mistakes because of it. I didn't have someone that could guide me. (ZEINA)

The importance of having mentors and career guidance is of high importance for NOHA who understood its importance while being a participant in Techwomen:

> We need a platform where we can empower women. I discovered this as a participant in Techwoman. I never had a help. I never had a mentor, someone who told me why don't you try this? Now I have mentors in Silicon Valley, they are helping me. And the power of mentorship, we still don't see the value of it here in Lebanon. (NOHA)

With that in my mind, some women came to face the reality of not having a mentor and resorted to other informal ways to get advice and some guidance for their careers. As an example, LAMA understands the importance of having mentors but also recognizes the limitations she has in her organization to secure a formal mentor so she sought other informal ways to get advice:

> Whenever I have a question that I want to ask, I would ask the person "What's your advice, what's the correlation, what do you think about that?". I would take opinions of people who I look up to. Not necessarily do what that person says, but to me, it's like a new spotlight, a new way of thinking. Searching for role models or for mentors, it's very important, especially when you feel down or you don't believe in yourself, you need people to lift you up. You need people around you, you need people to support you, you need people to speak with you, to talk with you, and this is very important and because I never had a formal mentor if you want, I know the importance of it. (LAMA)

For RAND, observing what other people are doing in the technology field and always being alert to changes is one way she adopted to learn and advance her career and business:

> I didn't have direct mentors. As I told you, I am very opinionated and very independent so I try to do things on my own. I do think mentors are helpful, but I can't say I have had an experience with that. Because I am in the technology business, I would look at people who are also working in the field, see how they operate. Anyway, seeing something you don't like is also a way to learn you know? So, my learning happened more or less indirectly than having an actual formal mentor. (RAND)

Gender Stereotypes Stereotype believes about the attributes of men and women are pervasive and widely shared in both work and non-work settings. Gender stereotypes not only denote differences in how women and men actually are, but also dictate the behavior and norms that are suitable and valued for each. Essential to understanding the career experiences of women in STEM in Lebanon it becomes imperative to understand the gender stereotypes that they are subjected to both at work and at home.

At work. In their interviews, the women discussed the various ways in which gender stereotypes contributed to an increase in gender bias in their work settings. The women discussed their efforts in proving themselves and working hard to counter the stereotypical perception of women's abilities and skills in STEM fields. In addition, concerns regarding their age and their motherhood status added further challenges to their careers. I present more details regarding the gender stereotypes the women faced at work below.

Proving oneself. The women went to great lengths to constantly try to prove themselves capable and competent in their work to counter various interactions that

amplified gender stereotypes or in which their abilities were doubted. SAMAR, an architect, explained how she worked on proving herself in order to get the right growth opportunities:

> I'm a person who challenges herself a lot, and I enjoy being competitive. But I always thought, that in some cases, I wasn't given the opportunities or specific job tasks because the management team were doubtful of my abilities as a woman. But I worked on proving myself and silencing them. I think in the 4 years that I worked at the company, I was able to prove that I could do the job quite well. I think it was the senior management testing the grounds of my abilities. They had to be reassured that I can do it, so I knew that I need to prove to them that I am capable of handling tough architecture tasks and the environment as a whole. (SAMAR)

Sometimes proving oneself was motivated by the need to challenge long held assumptions about women's abilities at work. For example, DIMA discusses her experience when she was starting her career as an engineer:

> In the beginning when I started my career in engineering, it's like you had to prove yourself as a woman, because men usually don't like to listen or take orders from women, especially in our eastern culture. So, you had to play it right and be aware that the men in the company still have rigid ideas of what a woman should do and how she should behave. (DIMA)

In another example, LAMA, an engineer working in her family business, recalls her own doubt with regards to her skills and the need to constantly work on proving her ability:

> When you work in a family business, you are always doubtful if you are respected because you are capable or because you are part of the family. So, this got me thinking and I asked my top management team, I mean, my financial manager, my HR manager, and my administration manager, if they think that I have actually achieved something. I always have the feeling that whatever I did even till now, is not enough, that I need to do more. I don't know, is it because I have really high standards for myself? Or maybe because I am a woman? I need to constantly work on myself and in some case I doubt my own achievements. (LAMA)

As for NADA, her desire for career growth in the telecommunication industry propelled her to change employers and focus on proving her worth in a start-up organization:

> When I was working in one of the largest telecommunications companies, the environment was safe, so I knew I would stay working there if I wanted. I mean they did have some perceptions regarding my abilities, mainly because I was only one of the few women working there. When I left them, and joined a telecommunication start-up, I knew it would be different because it was a startup and relatively young but I also knew that I had to prove myself in order to stay in the company. So, I guess me being a woman plays a role here. (NADA)

Working hard. In addition to proving themselves, the women also discussed the imperative of working harder to make sure they are one step ahead of their male colleagues. The underlying stereotype regarding women's work made the women focus more on their productivity to be able to demonstrate that they are competent

professionals. As an associate professor of computer science, NISREEN explains the need to work harder in order to be taken more seriously:

> I mean the fact that you're working in mathematics or computer science, you work in a very male-dominated field, that the stereotypes are everywhere around you, that you have to work 2 to 3 times harder than the rest of your colleagues to be taken seriously. And especially in a country like Lebanon, where the boys club is really prevalent wherever you go, you have to step up to get a share. (NISREEN)

A similar experience was also discussed by NAY, an architect who notes that as women they are always compared to a standard held by men and reiterates the need to keep on working harder and delivering impeccable work:

> You feel in the company that you are always being compared to your male co-workers and tested for your skills. This puts you on the edge to constantly deliver great work. So, I know I need to work harder than the men engineers and that I need to make sure that my work is error free. It's simply an embedded stereotype that they have regarding women's skills. So, I am constantly working harder. (NAY)

To illustrate further, LEYLA, a medical professional, explained how she viewed gender to be an underlying reason that prompted her to continuously work hard:

> When I think about my career, I can only think about the difficulty that I had to endure as I went along. I pressured myself a lot to constantly be an overachiever. At work, I always think how unfair the situation is. When I compare how much

> work I do in comparison to my male colleagues, I am always surprised by their minimal effort. I always think that I need to do more in order to establish my own reputation as a medical professional. But why, I sometimes think and I always go back to the fact that I am a woman. This is not very fair you know. (LEYLA)

Having to take on different roles in her software development job, was one way in which JANA could prove her worthiness to senior management and be able to secure the lead for a major implementation:

> I wear different hats, I am the project manager, the analyst, the developer…I have to take on various roles because I need to make sure that I am regarded as someone who is delivery oriented and has good knowledge about the whole process. It is constant work. I will give you an example. In 2016, our headquarters in Geneva decided to change the system that we worked on and I was responsible for the implementation of it in Lebanon. We had only 6 months to go live, and I would spend late night hours trying to work on making this implementation a success. I scarified weekends, summer plans, night in order to go live successfully. (JANA)

Being a mother. Women in this study discussed experiencing gender stereotypes with respect to their motherhood role. As working mothers, the women argued about the double standard that they face at their organizations as both professionals and mothers. NISREEN discusses this complexity while working in computer science:

> And then, at another layer of complexity is being a mother where I didn't have the time nor the energy to focus on my career as much as my other male

> colleagues did. Despite them being married in Lebanon, doesn't mean they are bound to the same time commitments that a married woman is. Because the culture is such that he can afford to stay in the office 12 or more hours on weekends and holidays whilst his wife takes over the whole household duty. So, I was both at the same time. I was expected to be the sort of traditional house wife… And I did it. Wholeheartedly. I'm happy about it. There is absolutely no regret. If I were to choose again, I would make the same choice and really put my family at the forefront of things. But I was trying to be these 2 conflicting individuals at the same time which eventually took a toll at my own mental and physical health. I feel I've missed many years of productivity that could – time will tell – probably bear an impact on the future of my career. (NISREEN)

This feeling of tiredness to juggle between the demands of both work and family was further made evident for the mothers in this study:

> Also as a mother you get very tired managing both family and work and you start feeling torn. There was a period where I was feeling guilty towards my girls and towards my work. You never feel that you've done enough for either and that you're losing control in both. (AMAL)

These demands led LARA to seek another career route that will accommodate the needs of her family and her role as a mother:

> The main drawback working in the technology field is your long schedule. As a mother that was very hard for me to be able to manage. So, I left work for 2 years, and I got 3 kids during this time. It was fine. One of the reason why I

> decided to work in a school and teach technology is to be able manage between my work and my family. I am now with the kids. We have the same vacation, we come and go together and we connect on different levels that I don't think would have happened if I remained working in industry. (LARA)

Further both RASHA and AMAL go into further details regarding how their respective organizations fail to understand and accommodate their various roles as mothers and as working professionals:

> As a mother, the first few years are very challenging in the sense that biologically you sort of go through setbacks that really affect your productivity to publish and conduct research. So, apart from having to be with the children, just having to bear requires a great deal of family planning itself. It's was also challenging for me, the fact that, as females you can go through miscarriages, once or twice. And so, despite that your promotion clock stops for around 1 year for each baby you deliver, the whole process of family planning is not accounted for, assuming that even while pregnant you can still produce as much!(RASHA)

> Actually, when I didn't get tenured, I left and I came to another private university and I gained a few more years to do my research, by that time my children were getting older. But in general, it was a very stressful time that the university administration didn't seem to understand. The expectations that I need to publish and produce didn't take into account my role as a mother. I remember the many night that I wouldn't get proper sleep taking care of my daughters and then I had to go in the morning with a smile on my face and teach and do research. That is

very hard especially when you feel that you are always evaluated based on metrics that are not really designed for women faculty. (AMAL)

Age bias. Some of the women experienced bias with regards to their young age while at work. For example, SAMAR reflects on her career as both a young architect and a lecturer:

> From the start, since I started working with at the large engineering firm and then when I moved to the university, I was always very young. I was always given a position with some level of authority when I was still starting my career, so a lot of people were doubting if can I do the tasks, thinking that I have the character but maybe I am not up for it, that I won't be able to do the tasks and deliver. (SAMAR)

Further, NAY explains how her age was an actual barrier between her and her team who wouldn't take her work orders seriously:

> I was in many situations where I was the youngest, and I had to take charge, and I used to feel that no one used to respect me or hear what I had to say, or even stop speaking. For example, in my domain ¾ of the employees are men, builders, foremen and when I ask for something or try to give a work task, I feel that they don't take me seriously and they look at me as if to test my seriousness. (NAY)

Similarly, NOHA who is a user experience and digital strategy consultant recalls an incident she had with a client and was surprised with his comments regarding age:

> One time while working with the quality manager from the client side, he made a comment that all the people around him are young and inexperienced. So, I was

> surprised because I thought he doesn't realize that I am that young too! So, to me it was like wow, how old do you think I am? So, I knew I had to act older so that he would trust my work. (NOHA)

At home. The women in this study had to face more intimate gender stereotypes that where constructed at home. Specifically, the women discussed their relationship with their spouse and the different models of care to be two challenges that they faced at home.

Relationship with spouse. Married women in this study provided insights into the relationship between household labor allocation and the construction of culturally appropriate gender identities. The women discussed their spouses' expectations with regards to household tasks and child care and the subsequent effect that had on their marital relationship and their own careers. For example, RASHA gives details about how the behavior of her spouse with respect to household tasks and child care led her to question the long-held gender stereotypes at home:

> I had to negotiate heavily with my husband about him picking up more responsibilities around the house. That didn't go very smoothly. I mean it challenges a lot of relationships for sure. And even the shared responsibility at home is still tilted a lot to… I mean I see my female colleagues and friends not all of them have very equitable households, including mine. So, I think it's a hard one because they are not things that even I was aware of. I mean I didn't know what to ask. So, you get set in certain patterns that you have to untangle, for example, when we had our kids, I was a resident, and you know as a resident,

> you work night shifts, or you have 13 hours shifts and you come back home. But it was always me waking up to my first daughter and I didn't question it. I didn't know to question it until I came on the verge of a break down and I was like why am I having to do everything. I mean I am doing everything. I am bringing most of the money into that household. I am also working the heaviest hours… I mean my husband was a PhD student at the time as well, but my schedule was still busier than PhDs and then on top of that I was the one who was having to wake up and also be the primary care giver and manage the nanny's schedule, and manage the cleaning of the household, and all of that. And that had a toll on my relationship with my husband, who didn't seem to notice that he should be pitching in. (RASHA)

Further, ZEINA's husband would be make it clear that he can't understand why is she focusing a lot on her work at the expense of her children:

> In the last two years, my husband was super frustrated because I was always very busy, I would have meetings outside the house and because my work is flexible, I would have to work at different times. Also, because he travels he used to comment that I am not spending a lot of time with the kids and that I am leaving them with the nanny, so he wasn't too happy with the situation, and used to complain a lot. He was at some point impatient, especially since I was spending a lot of time doing a lot of things that were not directly fruitful. However, I think now he has seen the benefit of all of my hard work, because all the work that I have been doing over the two years is what helped me get into entrepreneurship,

> allowed me to open my company and made one of the largest universities in Lebanon aware of my added value. But no doubt that at many points in time he got frustrated with what I was doing and he would ask "then what?" (ZEINA)

In the same vein, LEYLA's husband also commented that her time investment at work was causing her to neglect some of the household duties:

> My husband is open minded and had always encouraged me to follow my career, but at some point, when I was spending a lot of time working he commented that I was neglecting the household duties and that I need to realign my priorities. (LEYLA)

Different models of care. The responsibility of child care was made obvious to be the responsibility of women. The women in this study discussed how others stereotyped them as the primary caregivers, dismissing their roles as professionals and tapping on different models of care. For AMAL, an assistant dean at one of the private universities in Lebanon, this was clearly experienced:

> You know everything falls on the shoulders of women. Whether it's taking care of children or elderly, you are the one responsible. In my family, we are 3 girls and 2 boys, but only us girls take care of our elderly mother although we all work. But it is somehow expected that as a woman I am the caregiver no matter what my professional life demands. (AMAL)

The perception that women handle care giving responsibilities seems to take precedence over the women's career in such a way that surrounding family members place pressure

on the women to focus her energy on bearing children while dismissing the toll of care duty and its effect on a woman's career:

> I went through many problems with my parents and in-laws regarding my work and my biggest challenge was and still is until now that neither my mom nor my mother-in-law are available to help me with the kids. When they retired, each went in a different direction; my mother-in-law went to the village, and my mother was intermittent between Beirut and the village, so when they tell me why I am not having the third child, and that I have postponed for too long….my son is seven now, I always tell them that you are not close to me to help me out so you can't tell me what to do. (ZEINA)

This idea was further stressed upon by RASHA, a medical doctor who views child care in a unique way:

> It's also reflecting a culture in Lebanon of just outsourced work in general, care in general. I mean domestic house help model of taking care of your kids, of taking care of your home. Everything is outsourced to domestic workers. So, people don't see it as an issue or don't necessarily understand what your struggle is. Why I don't just get a housekeeper to take care of things, when I don't want help taking care of my kids. So, there is a lack of appreciation of different models of care. I mean this is the set standard. So, there is that. And then, so there's just the culture in general, there is the domestic worker that also adds to this. People don't understand that some people want to take care of their own kids and don't want to outsource that. (RASHA)

Category 4: Coping Strategies

The fourth category sheds light on the **coping strategies** that the women adopted throughout their careers in STEM. Coping strategies here refers to specific efforts that the women employed to face the myriad challenges that they have encountered. In their interviews, one of the prominent coping strategies that the women thoroughly discussed was the importance of *managing one's own career path.* It became very important for the women in this study to be able define the parameters of their own careers by either starting their own business (i.e. following an entrepreneurial path) or by taking control of their career. More interestingly, the women actively *engaged in change management practices* that included influencing HR policy making, empowering other women at work and building trust with colleagues. As I will discuss later on, these efforts allowed the women to create a better working environment for themselves and for other women working in STEM fields in Lebanon. Further, the women also resorted to various strategies to *manage conflict* that would arise at work and they primarily discussed three strategies; being adaptable, confronting and having family support. The women then went further to discuss the outcome of these coping strategies on their careers and lives. In what follows, I will go into more depth regarding these coping strategies.

Managing One's Own Career Path One of the ways the women coped with their challenges was to properly manage their own career development. Reflecting on the participant's narrative, managing one's own career path designates the woman's conscious effort to overcome the various constraints on her career by either resorting to an entrepreneurial path or by taking control. These two coping strategies allowed the

women to be in more control of her career and to face the challenges on her own terms. I will now go into more depth with regards to each of these two coping strategies.

Becoming an Entrepreneur. One of the ways the women took control over their careers in STEM is by charting an entrepreneurial route where they worked on creating and developing their own organizations within the STEM ecosystem in Lebanon. The women discussed in details the rationale behind their pursuit of an entrepreneurial career path. For example, NOHA explains how the challenges she faced at work prompted her to try something on her own:

> I got so tried trying to always fight for my rights at work. So, I thought why not try to explore doing something on my own. So, I took a risk, it wasn't calculated, and it wasn't planned, but it worked perfectly. At that time, I didn't have any family obligations, I only had my rent and other expenses to worry about. So, I thought if not now when! if I don't do this right now, build something on my own, when am I going to do it? And this is when things started to pick up in very different ways and I realized that I can do it on my own. (NOHA)

Similar sentiments were also shared by SARA, who realized that her advanced technology skills will allow her to explore different ways of working outside the formal employer-employee framework:

> After working for a while in an organizational setting, you realize that you have developed the skills to go solo. I mean you get the experience, you understand the infrastructure, so why not explore things on your own. This is what I did. After working for years, I thought to myself that I have the skills, so why should

> I be bound to one organization? So, starting my own thing, opening my own clinic, seemed to be the right idea and way to go forward. (SARA)

For these two women, opting for an entrepreneurial path came as a response to the workplace challenges that they faced. In turn, they decided to leverage their skills in the technology sector and start their own business. For other women, their pursuit of an entrepreneurial path came as a realization that their career growth cannot be bound to an organizational context. Instead, in order to grow, these women decided to address a particular shortage in the technology infrastructure in Lebanon. For example, ZEINA and FIDA shared:

> While I was working, I realized that in order for me to grow in the technical field I needed to do something on my own, something that I knew will address a lot of issues. So, based on my experience, I wanted to create an organization to prepare young students with the needed technical skills that they would need when they work. So, I started my social innovation company that mainly focuses on equipping youth with social innovation skills, mainly focusing on digital technology and entrepreneurship as well as developing social and community engagement skills. So, we teach them these skills that they can then implement in a real-life scenario to solve an issue in their community. (ZEINA)

> I knew I needed to grow my career so I started technology and coding a company. I mainly teach programming skills online, via Arabic video courses. The market is mainly in Lebanon and the Arab world and I started it with a landing page in the first 2 days and with 1, 200 subscribers. Now I have 63,000

> subscribers on the website and I am building the second version that will be launched at the end of this month. I also worked on building a revenue generating model. For example, a developer can sell his/her course online and I will charge them a 40% fee and they will take the 60% of sales. In this way, I was able to set my own standards of work and create the impact that I wanted. (FIDA)

For NADA, the realization that entrepreneurship is another way where she can overcome the various challenges that she faced at work came after her participation in Techwomen. She credits her exposure to different ways of working to be the reason why she is thinking of pursuing an entrepreneurship path:

> After participating and spending more than a month in Techwomen, I realized how empowering the experience was for me, especially as a middle eastern woman working in the technology field. My experience there resulted in mindset shift. I realized that I didn't have to work for someone and just be an employee. I can actually start my own business and have more freedom. I started thinking: "What do I want from this life? What can I change?". At that point, I started to look around for people who are going through a similar experience and I thought that maybe collectively we can start a business that will create a change in our society. I thus collaborated with three women who were also Techwomen participants and we mainly wanted to do an impact for the youth between the ages of 17 and 25. Our aim was to empower them with the digital and 21st century skills that are needed for current and future workplace. We also wanted

> to teach them the essentials and importance of communication and negotiation skill. (NADA)

As for SHIREEN, being an entrepreneur is a goal that she is working towards. SHIREEN realizes that she still needs more experience and a solid graduate degree to reach her end goal:

> Someone with my personality should be an entrepreneur not an employee who is constantly facing a lot of organizational challenges. I don't know when but I will open my own architecture office one day. First thing I am doing is completing my master's degree in construction management which will give me the needed skills to manage large scale projects, and not only residential. When I open my own business, I will do commercial, or large projects but I need to have more experience and build my connections. I need to be able to know the kind of projects that I enjoy working on. (SHIREEN)

While for ZEINA, acknowledging the cultural perception regarding entrepreneurship, she goes further to suggest that being an entrepreneur can also happen within the organization itself:

> In our culture, it is very common and actually preferred that you find a secured job after you graduate. I mean there isn't any encouragement to start your own business and I understand that. But I think it is very important to at least try to acquire the mindset of being creative and innovative and to think outside the box. Even if you work in a company you can still try to innovate and follow entrepreneurial traits while working. (ZEINA)

Taking control. Another way the women sought to manage their careers in response to the various challenges that they faced, is through taking control of their work, relationships and the expectations of others. For some of the women, being able to pursue a STEM career, meant being proactive in their decision making and reaching out to others in order to secure their desired position. ZEINA shared:

> I had recently finished my master's degree in engineering and I thought why not reach out to the chair of the engineering department at one of the private universities in Lebanon and tell him I am interested in a part teaching opportunity. In our meeting, the chair told me that I qualify for a teaching position, but I will need to wait for the next academic year. In the meantime, in addition to my full-time job, I taught part time in another university and developed my teaching experience so that when the next year came around I was able to apply and be recruited to teach at the university. (ZEINA)

In an attempt to counter the long rigid working hours in the telecom industry, NADA sought to find a job in an organization that will give her ample flexibility in her work schedule:

> I decided that I wanted a job that will give me more flexibility with my time and work schedule as well as more freedom. I decided to quit my job without having any other alternatives. I stayed unemployed for almost 3 months but then I found a company that had a great working schedule. I had one day where I can work from home for example. But then I also started thinking that I want even more flexibility, so I transitioned to a full remote role. I was able to find a job with an

> international company in the VOIP industry, that allows me to work from home. So far, I am really liking it and I realized I worked best this way. So even in the future that's the kind of jobs I will look for. (NADA)

While for REEM, taking control of her career and growing her own business meant understanding her clients and what works for them. She realized early on that pursuing "best practices" without tailoring them to the Lebanese market will result in a business failure. She explained:

> For us we knew that if we wanted to enter into the market and really establish our name and gain reputation, we have to understand the Lebanese customer. I mean we have to be flexible regarding how we approach them. We could have told them you can put your request through our application or on our website, but that doesn't work here. If we did this we would have closed like other companies did. Lebanese people like to build a relationship. The customers would call us or message and felt the need to talk to a person. This is very tiring by the way and doesn't allow us to scale our business. But this is how we gained market share because we are very costumer oriented. (REEM)

As for both DIMA and ZEINA, managing the expectations of both their clients and their husbands regarding their careers was a necessary step for them in order to grow their careers in STEM. DIMA shared:

> I think you need to manage your duties well. Actually, when you put a schedule, when you manage your time, and when your clients know how you work, it is really helpful. For example, there's one day a week I don't come to the office, and

> I focus on my kids. I don't have meetings or calls, so my clients know that, it's been almost 5-6 years like that. In a way, I need to be in charge of my career. (DIMA)

ZEINA further explained:

> I mean my husband now is putting pressure on me to have another baby. This time I know very well that if I am going to get my third child, I will not stop my career like I did with my first two children. If I stop in my thirties, I would have lost all of the career opportunities and what I have built so far. I think that the pause that I did after my first two children has affected my career negatively. I feel that I am racing with time and I need to return to catch-up. Even now, my mom tells me to take it slowly, and I tell her if I am not going to work hard now, when will I? I am young, I can do it. (ZEINA)

While for RAND, her efforts to manager her career centered around her efforts to defy the norms within her culture:

> How many times have you heard women saying: “My husband doesn’t let me, or the Lebanese law doesn’t let me…”. I mean as women we should stop acting like we are the victims. We are not a victim! Today, if I wanted to wait for the world or the milieu to be ready for me, I think I wouldn’t be where I am right now! I am responsible for my own growth. I can’t wait for my society to be ready for me. (RAND)

In another way, some of the women discussed how they used their position as women working in STEM fields to their advantage. For example, REEM shared:

> You know I always hear how being a woman in the engineering field is tough, which I tend to use it for my advantage. I used to take advantage of the fact that people get a little bit surprised that I am the site engineer, but at least that means I got their attention. So, I take advantage of the fact that I already stand out and then I turn it into something of value to both the project and the team. (REEM)

Further, RAND discussed how her behavior would change with respect to whom she is dealing with:

> As for their often-quoted machismo, I have learnt to fluctuate between shy and confident, feminine and masculine, strict and diplomatic, and both a technician and a sales person. As long as respect, integrity, work ethics and deliverables are not compromised, the man in front of me can deal with whichever side makes him comfortable and less threatened. (RAND)

As for RAND, realizing the importance of having women in the technology industry, she makes it clear that her recruitment efforts will revolve around hiring more women for her business:

> In the technology industry, the lack of presence of females is very problematic. We see things differently, we look at aspects of the business that men do not look at. So, having a woman there is different. The way a woman deals with things is more flexible and diplomatic. How you interact with clients and how you approach things. Once I started my own company, I knew I wanted to hire more women because I know they will bring change to this industry. (RAND)

Engaging in change management In addition to managing their own careers, the participants discussed organizational level efforts that they engaged in as a response to the various organizational level challenges. Here, the women engaged in change management efforts including influencing HR policy making, empowering other women and building trust with colleagues as coping measures. In the below, I go into further details regarding each measure.

Influencing HR policy making. One of the challenges that the participants discussed revolved around gender-stereotypes that they faced at work and the lack of resources for their career development. Realizing these challenges, some of the participants geared their efforts towards influencing the HR practices and policy making at their organizations. For example, LEYLA shared her experience as part of a gender task force at the hospital that she works in:

> The university started a gender task force and there are efforts in place to make its practices more gender equitable. For example, right now, the majority of the women are hired into non-professorial ranked faculty positions. Whereas the majority of men are hired into professorial ranked position. So, there is a huge issue at the hiring and recruitment level that we should address. With that also comes other issues regarding compensation. So, as a task force we spent some time collecting data and doing climate surveys and we are now at the implementation stage where we are working on providing recommendations to the HR department regarding its practices (LEYLA).

Similarly, RASHA went into great detail in explaining how she is trying to make changes at the HR level at the hospital where she works:

> Through the committee, I am now focusing on the selection, promotion and hiring procedures, and pushing for a mandate to have at least one female candidate for faculty recruitment. I want to get everybody to think if there is a woman that they know that can potentially be a good candidate. Also, because there aren't enough women at senior levels in the faculties at the medical center, most of the advisor committee members that are responsible for hiring, promotion and appointment are men. By regulations, have to be a full professor to be on the advisory committee. So how many female full professors are there? And are there gender biases here? So, one of the things that we recommended to the president is that in these committees, the individuals should be trained on gender and implicit bias, having them part of the conversation is important. (RASHA)

In another effort, RASHA also gives an example how she worked hard on changing the compensation structure of her department in order to recruit more competitively:

> I was also the interim chair at that point. The reason I became interim chair is because I changed the compensation structure of the department in a way that allowed us to recruit, competitively from the US. So, one of the reasons why we also had more women was because of a financial infrastructure that I helped create that allowed us to recruit them. (RASHA)

Further, while establishing her own business, REEM made concerted efforts and changes at the HR level in order to attract more women to her business:

> We want to be fair with all of our employees. Especially the women. We offer part time jobs and even contracting jobs. For example, we have some of the women working for us on a contracting basis, they tell us which areas they can cover, how many deliveries they can handle and what hours they can work. From the start, both of our expectations are aligned. We are also flexible with our hiring approach. For example, we had a woman join us who had a lot of experience, but she has logistical issues. She lived in the south and her children finish school at 3 pm and she is the one responsible for picking them up. So, what we did is tailoring the job description and the working hours for her situation and then have the salary reflect that. I try as much as possible to be accommodating to the needs of my employees and of course it depends on the position and tasks. (REEM)

She further notes the importance of breaking down the barriers for women employment:

> We always try to post job vacancies in a manner that invites women to apply. We feel strongly that it is our role to break the barriers and the challenges that we have previously faced. I mean, I started this company so I can make the needed changes to attract more women. We recently recruited a woman who has been working in accounting for the last 17 years. She felt the need for change. She now works with our delivery team and is really great. I mean you need to give woman the opportunity to actually try things. (REEM)

Similarly, MAY explained how she worked around the system in order not to lose competent employees:

> Especially here in Lebanon, we don't have part-time opportunities, we don't have flexible work environment, all of these don't exist. So, I have lots of employees who are on a part-time basis. They are here from 8 till 1h30 and then they leave for their family. But I mean, they are very competent. Imagine if you don't give them this opportunity. They end up being at home just because of the work environment. I mean there is a lot of these cases. Because employers here in Lebanon are not empathetic with women specifically. (MAY)

Similarly, RAND shared:

> When I think about my own business and how to grow it, I always try to hire more women. Recently, I hired a new assistant and I was deliberate of hiring a woman, although I could have easily hired a man. I decided not to because it's important to get women in, so they can understand the business. I am also trying to do the same thing for my team in Dubai. I have recently hired a woman into an administrative job, but I will have her do some extra trainings so she can start working in the field. (RAND)

Empowering other women. Another way the women coped with the various challenges that they faced was through their conscious efforts to empower other women to reach their career goals. Empowerment here was carried out in different settings, including organizational and cultural. For example, FIDA discussed the importance of women supporting each other and how is she contributing to that mission. She shared:

> I think the road to changing how women are looked at in STEM is through women supporting other women. I have gone to places where my main supporters were women, and I wouldn't have been in those places if it weren't for them. So, I do believe that women in high-level positions should help other women advance. I have been personally doing that for the least year. I started something called 505hours.com, and I give 100 hours of free advisory per year for anyone in the technology sector, but I tend to prioritize women. I'm still working on it and it's still in the development phase and it's mainly to connect mentors with mentees for free. I'm also the tech-stars community leader in Lebanon. So, we're doing a start-up technology weekend in August in one of the private universities in Lebanon and my whole team is made up of girls. Every single girl who ever told me she wants to do start-up weekend I just brought her in. I didn't mean to exclude boys but I do give priorities to girls. (FIDA)

A similar approach was also shared by SARA, who works on providing one-on-one mentoring for her women colleagues:

> I help anyone who comes to for an advice, but I give women more one-on-one time. I always tell them not to be afraid to ask for help and not to hesitate to contact me via email. I found that men tend to be more proactive about this issue and I wanted to encourage the women. I also want to support women to grow in their careers, so I always emphasize for them the importance of not giving up and that I am available to help them face any challenges. (SARA)

As for RASHA, reflecting on her experience as a medical doctor, she explains how she is more empathetic and supportive of her colleague's daily struggles:

> I think I just try to support everybody I work with, but I also have a good understanding of what some of my female staff members might be going through and I am normally flexible about it. My own experience has helped me put things into perspective if let's say someone has a new baby, or is having problems at home. I tend to be flexible. I mean the way that I am trying to make an impact– in a broader way on women – is also through my research studies. It's actually going to be on gender in medicine. And I am actually going to be looking at leakage. I am going to be looking at the other end. (RASHA)

Further, as part of an international organization, MAY discusses how supporting other women develop their career is a reflection of her organization's gender equality culture:

> We're an organization that pushes for gender equality. VPs, half of them are women. It's an organization that practices what it preaches. I've never felt like I'm a threat, I've never felt that I'm not going to grow because I'm a woman. Not at all. I mean I'm so grateful for this spirit, this culture, and I try to do the same with my team here. If you talk to my team, you will realize that I have never restricted any opportunity for the women. On the contrary, I want to develop and make them stronger in their work. (MAY)

In other attempts, the women sought to influence the culture around them in order to highlight the importance of women empowerment in STEM careers. For example,

DALIA explained how she decided to create a committee in order to highlight what women engineers in Lebanon are up to:

> As part of the Orders of Engineers, I decided to create a committee to highlight the achievements of women engineers working in both the public and private sector in Lebanon. Since we created that committee, we organized a conference and a series of seminars that discuss the important issues that women engineers are doing in Lebanon. (DALIA)

Closely related, ZEINA notes the importance of having women lead conferences and showcasing their skills and abilities in order to demystify any stereotypical thoughts that the general public might have. She shared:

> There's something that I highly believe in and that is the empowerment of women. For example, I think women empowerment can be exemplified by giving women the chance to offer training programs instead of organizing a conference on STEM that will only discuss their challenges. It is very important to give the woman the opportunity to demonstrate their skills. Once women start showcasing their abilities in STEM fields, the general perception will start to change. The conference "Women in Data Science" that takes place at AUB is an excellent example where women in tech discuss their work and technical aptitude. This in turn helps highlight the women working in that field and how they can be role models for the youth. (ZEINA)

Further, JANA engaged in various activities in order to empower young girls to pursue a career in technology:

> I have been actively involved in the business and technology community in Lebanon, specifically the one focusing on women. As part of my involvement, I decided to start a Lebanese chapter for an organization called "Arab Women in Technology". We mainly seek to partner with local organizations to create technology oriented conferences and hackathons. Recently, we joined efforts to launch an initiative called Girls Got IT. This initiative works on empowering school girls between the ages of 15 and 17 to know more about the technology field. We do workshops and try to connect the girls with startup companies so they are more familiar with the eco-system in Lebanon. For example, we had 500 school students in a one day event and they are divided over several workshops. The workshops discuss how to build a mobile app, how to code and other things. We especially target remote areas in Lebanon where this knowledge is absent. (JANA)

As a robotics teacher, LARA realized the importance of tailoring her classroom materials in a way that will encourage girls to actively participate:

> Research tells you that boys have better spatial orientation than girls. I disagree and I think that is something that you can train. I thus decided to come with activities that can be included in the math, science and technology curriculum at the school to further train this skills for girls. Including robotics for example is very important. Robotics is great for spatial orientation. A study showed how when you give girls the chance to interact with technology and better understand

it through daily encounters and discussion, their mental orientation towards technology will be triggered. (LARA)

Building trust with colleagues. The importance of gaining and building trust with colleagues was another way the women coped with the organizational level challenges and the stereotypes that were constantly subjected too. Here, building trust with colleagues signifies the women's efforts to build their credibility by trying gain trust and legitimacy at work. LAMA shared:

> Working as a women engineer is not an easy task. In order for my boss to believe in me and give me a challenging job, he has to trust that I can do it. In order to do that, I worked on developing my competences and skills. I also tried to approach things in a more scientific way while also understanding my own shortcoming. I worked on the areas that needed improvement and focused on developing them. (LAMA)

Further, DIMA discussed how she worked on proving herself as one way in which she was able to gain the trust of her co-workers:

> Early on, I thought that it was very important for me to prove myself. I knew that if I can show everyone that I can do the job, they will trust me. This approach allowed me to face any skepticism that anyone might have had about my work. I also realized that when you start proving yourself, you both build trust and respect. But all this take time, I might make it look easy, but it's a lot of work. (DIMA)

For both REEM and RAND, growing their careers in both the engineering and technology fields, respectively, required them to face off any challenge by being proactive and earning the trust of their team. They both shared:

> All the technical team that I was working with were older experienced men. I knew I had a role to play to earn their trust and respect. Also, I have never been afraid to get my hands dirty in the job. I was very passionate about my job, and being a woman wasn't going to stop me. (REEM)
>
> As an individual, I am both a positive and a stubborn person. I never allowed any of the challenges to stop me from reaching what I wanted. The first time I went to see the how the mechanical garages operate in Lebanon, they barely welcomed me. However, a week later, I received a call from a manager that works in one of the garages asking me if I can come over and check on one of the machines as it's not working. Although I didn't sell them the machine, I used this opportunity to gain their trust. I learned the hard way that people only treat you the way you allow them. In the middle east region, it's very hard to change that mentality, especially for the people who work in the automation industry. So, I knew I had to exceed their expectations, both technically and professionally in order to gain their trust and respect. (WT1)

Managing Conflict. To further cope with the challenges that they faced, the participants discussed the strategies they adopted to manage conflict. Here, managing conflict denotes the process the women adopted to identify and handle conflicts in a sensible and

fair manner. The women adopted three strategies to manage conflict; being adaptable, confronting, and having family support. I will discuss each in more details below.

Adapting. For some of the women, adapting to their organization culture was one way in which they managed the conflicts that they would face. Adaption also meant that some women had to accept the status quo in their organization in order for them to move their careers forward. For example, SAMAR, an engineer who leads her own research lab at a university discussed the bureaucratic culture that she has to face and how she adapted to it:

> Working in an academic institution is harder than working in industry. After joining, and realizing the bureaucracy that's embedded in it, I knew I needed to change my way of work and to adapt to them. I knew that their structure won't change. I adapted to them but they didn't adapt to me. I took that as a cultural and organizational difference. I think participating in Techwomen has taught me not to take things personally, and to understand that in a lot of cases each institution has a different culture. I think the moment I took this into account, I started going with the flow and realized that I need to choose my battles if I wanted to stay working at the university. (SAMAR)

Further, RASHA shared how the culture of her medical institution limits her ability to actually initiate any change. She discussed her rationale behind why she chose to adapt to her organizational culture as one way to cope with the challenges:

> I didn't even attempt to make changes at work. I think there are so many other priorities. And when you're so much a minority, I don't feel I am the right person

> to raise it. I think you need to be a bit more than 20% to be able to raise those issues without reflecting negatively on women in general. I mean if I am the only woman, I'm not going to raise it. If I'm in a meeting, and I'm the only woman in a group of 12 people, they are all surgeons who need to set a meeting outside of work hours it's a lost battle for me to say by myself "no but please, I need to get back home". It's not going to happen. So, there is no point in even raising that. (RASHA)

As a computer scientist, NISREEN described an organizational culture that wasn't friendly and how she coped with it:

> There have always been issues at the departmental level. I mean, things are much better now. I can just say that it wasn't by large, it wasn't a very friendly place to be at and I had to deal with. I didn't cope well. I just had to accept certain things the way they are. (NISREEN)

Similarly, NADA had to adapt to her manager's way of work in order for her stay at her job:

> I used to fight and disagree a lot with manager, but then I realized that will not get me anywhere. He is in control. So, I started doing whatever he wanted, even though I wasn't convinced. I just wanted to avoid fighting and creating problem. I was mainly working for my salary and to get more experience in the technology sector. I knew that I would leave eventually. (NADA)

For MAY, she resorted to adaptation as a means to build relationships and get her job done:

> When I think about it, I know that I learned to change my approach depending on whom I am dealing with. I am not a hypocrite, I just adapt to different situations and people. I learned to change. I think this is something really crucial. How can you adapt, how can you work with others, how can you build trust. Whether it's a professional or personal relationship, you need to bend a little to get what you want. (MAY)

On a more personal level, NAY prefers to adapt in one system and grow in it, instead of changing it:

> Honestly, I am someone who is scared of change. I don't like it, especially at work. I am used to the current culture, so why should I leave and start somewhere else and have to re-adapt to their system. (NAY)

Confronting. Unlike the women who chose to adapt to the challenges that they faced, some of the participants were diligent to confront them. For example, SHIREEN discussed how she challenged a particular stereotype while working on an engineering site:

> I think my strong personality helps me a lot. I defend myself, I speak out and I don't let things just pass by. For example, when I was working on site, I used to have my male assistant follow me everywhere, since he thought it wasn't suitable for me, a woman to be alone on site. So, I had to make it very clear for him that I can handle this by myself and I don't need anyone to follow me. Also, at work some of my male co-workers would try to take credit of my work. I wouldn't allow that to happen and I would stand up for myself instantly. (SHIREEN)

REEM discussed how she refused to have her gender dictate what she could do and how she had to confront certain situation to prove that:

> I used to take the lead and I never shied away from work that some would consider to be very tough for a woman to handle. One time while working for a façade of a building, we were required to swing and go down. The technicians who were working were afraid of doing that, so I decided to use that situation to my advantage and volunteer to go down. I wanted to change how the men thought of me and what I can do. I wanted to challenge them so they can change their mindset. (REEM)

For RAND, her experience as a woman working in the automation industry made her realize that she has to take concrete actions in order to change the stereotypes around her work:

> One time I was having a meeting with a manager of a vehicle inspection company. For years, they have been doing a visual inspection for their cars and it was very hard for me to explain to a man that what he was doing was wrong. So, in our first meeting he wouldn't even look at me and would always answer the male partners instead of me. So, I decided to move my chair and sit right in front of him. I smiled and I asked him to respond to me when talking. At that moment, I can't dent that I was scared he would kick me out. (RAND)

Similarly, NISREEN took action and confronted her university administration with regards to her tenure pause:

> The idea of pausing your tenue clock after you give birth came into effect for professors who joined the university after me and I wasn't able to benefit from it. I thus petitioned to say, at the time, when this decision was approved, I was still bearing my children. So, my elder was four, my youngest was 2 months old and that was still highly taxing on you career. When I approached the previous administration, they said no. So, when it was time for the new administration, I petitioned to say that I think, out of fairness and consistency, that I need to benefit from the same pause and promotion clock that other female faculty members currently enjoy. They approved. Thankfully they were all supportive from the level of the associate provost, who's now our dean and the provost and the president. (NISREEN)

Further, FIDA discusses how she had to confront her critics while building her own business. She shared:

> Unfortunately, not everyone was taking me seriously for starting my own business in the technology field. One time I was in a meeting and this guy, in response to what I said, started saying "yeah, yeah, yeah…" and I was like "excuse me? I am saying something and you are shutting me up so you can talk? No that won't happen. You do not understand what you're talking about more than I do, so please do not shut me." I mean you don't see this happening to men. It is like they just want to mansplain things to you or interrupt you. So, you have to speak up or else they will run over you. (FIDA)

As for both LAMA and NADA, their confrontation also reflected an injustice situation that they faced for being women:

> The challenges I faced being a woman, even if they were gender-biased things, I dealt with it them on the spot. If there was an unjust situation, I interfered. I didn't allow my gender to be the reason why I didn't advance. (LAMA)
>
> I didn't quit. If I have an opinion I am going to express it. I got more confident and I was more aggressive. The more they made me feel like I couldn't talk, the more I did. (NADA)

More personally, NOHA expressed how she had to confront the stereotypical notions that are present at the cultural level in Lebanon:

> You get to a point where you realize you are lucky to have become independent early on. I got to live alone. Not with the pressure of my family all the time, asking me "why aren't you getting married soon? Why are you working this late?". No one asks me what time I come back home or where I was. I don't have a job that finishes at 2 or at 5. I have a business to run. So, I had to defend it all the time. I know people still judge me and they think I am single because I work a lot. Which is not the case. I am not single because I am working, I am single because my career also matters. (NOHA)

While for FIDA, things got more personal when a previous employer started ruining her reputation:

> I'm suing him just for the money because he started talking behind my back, and for me my name is the my most important thing in this ecosystem. That's the

only thing that I don't accept any one to mess with. I decided to sue him for the money he owed me, for the months of work that he didn't pay me for. (FIDA)

Seeking support. Another way the participants were able to manage their conflict was to actively seek support from their families and other members. As a coping strategy, the women sought external help to help them balance the demands from both work and home. For example, LEYLA talked about her support system:

> I have a whole support structure, my mum and my parents helped me a lot when I came from the US, my husband's family also helped. I'm lucky that I have had good support and loving parents who have helped me care for my kids in such a way that they have turned out to be good kids. So, maybe part why I don't feel the pressure is I have good performing kids. So, I mean when you go to the award ceremony at my kids' school, most of the awards go to the people whose moms are working. It's not like "oh look! This kid whose mum is at home is helping him study and therefore performing better." (LEYLA)

Further, NISREEN acknowledged the the support she received from her husband enabled her to manage the needs of her two girls and to be present for them:

> My girls are 8 and 12 years old. My day normally start with getting them ready for school. After they are ready, my husband would take them to school and I sort of leave early to the gym, and then come back home, get ready to start my own day at work which begins around 9 o'clock. I take my breakfast, coffee and lunch, all that you can think of in my office. So as not to lose more hours. I pick up my elder daughter and my husband picks up my younger daughter. I go home.

> I sit with the younger one to help her in her homework. Luckily, I have somebody who comes in and help me with cooking. So, I don't have to worry about that, you know? Distracting myself with household duties. So, all I have is to be with her doing her homework. Also, because they are girls and as they grow older it becomes more contingent upon me to be around them. Especially my teenage girl now. I don't think I can delegate too much. So, my husband helps out. (NISREEN)

As for RASHA, she reflected on the support she had received from her children's nanny's while pursuing her medical residency and later on when she was employed:

> I mean when you graduate from residency, you have to go up and say like a one-minute speech and I didn't know this. So, in the graduation party, the gala, I saw people get up and I was like "oh my gosh I have to say something" and everybody was getting up and saying "I'd like to thank my wife, my spouse…" and I was like "I want to thank - the one person that came to mind is Guena". She was our baby sitter. She was an Italian American woman but she was really the person who kept my life together. I didn't end up saying that. It would have led to a divorce– everyone's thanking their spouse and I'm like thanking my baby sitter – but really, the reality of it, it's the great women who have been taking care of my kids and I try to choose them selectively. I mean right now, the person who was visiting us last night was a university student. She's Kenyan originally, and she took care of my kids for 2 years after school. But she is just an amazing person, very artistic, very creative, and just a very fun person. So, now she's not

> taking care of my kids anymore but she still comes and visits. She has left my kids with such creativity that is definitely not for me. I mean she is just such a creative person and she would do art with them and just games that she played. All these people are people who supported me but allowed me also to be away knowing that they are offering my kids something that I can't even offer them. (RASHA)

Outcome of Coping Strategies. More interestingly, the participants gave way to the outcomes of the various coping strategies that they had adopted. For example, ZEINA discussed how being an entrepreneur enabled her to make a difference:

> I am an entrepreneur now, I call myself a social entrepreneur. I saw a gap in our technical education programs and I thought I need to do something. I feel that I'm doing a difference. I feel that people are being convinced about the importance of entrepreneurship and technology. I especially want to attract girls to the program. After I launched it a lot of people started registering and showed interest. I started hearing more about the social impact and I hope that I'm influencing the entrepreneurship and technology eco-system in Lebanon. (ZEINA)

RAND recalled how her confrontation led her to have one of the best client relationships:

> After I sat in front of the manager and confronted him with what he is doing, he turned out be one of our best customers. He comes to me for any technical support and advice. His project was even published in the German's supplier

booklet for being an extreme project because it was being carried out in Iraq. (RAND)

Unfortunately, not all the women had a positive outcome after their confrontation. ZEINA and NISREEN shared:

> With regards to the course, I mean I tried to do something about but at the university it's very tough to move professors you know. I wouldn't get anything in return and the department head told me not to complicate things with the chair. (ZEINA)

> The fact that I couldn't give afternoon hours translated into not being able to give graduate courses that are normally held in the evening. Although I tried to change things, that didn't work and I wasn't assigned any graduate courses. (NISREEN)

Category 5: Career Reflection

Career Reflection

The fifth category is Career Reflection. Career reflection here denotes the women's intentional reflection on how their careers unfolded and how they perceive their careers to be on the long term. Specifically, the women discussed the things that they would have done differently when it came to their careers as well as how their engagement in self-reflection allowed them to better understand the purpose behind their career pursuit. In what follows, I discuss these two ideas in more details.

Doing Things Differently. In the process of reflecting on their careers, the participants discussed the various things that they would have done differently regarding

their career pursuit. The women mostly discussed the skills that they would have developed and some of the networks that they would have engaged in. For example, RAND and NOHA, succinctly expressed how they would have believed more in themselves:

> I would believe more in myself. Just that. In my own abilities and skills. I was doubtful of myself. (RAND)
>
> I think I would have trusted my instinct more. I shouldn't have seconded myself when it came for my work. I have developed the needed skills to pursue a career in the technology field and I should have been more confident about that. (NOHA)

Further, LAMA shared that although her experiences have shaped her to be the woman she is now, she would have nonetheless, worked on increasing her sense of work maturity and seized to take things personally:

> How I see it, is that I am the result of my own choices and I am happy with who I am today. But at the same time, I wish I had the same level of maturity that I have now in my thirties back when I was starting my career. I would have been more confident in pursuing projects and I wouldn't have taken things so personally. I would have embraced a more developmental approach to my career. (LAMA)

Similarly, FIDA discussed how she would have changed her behavior and be more assertive at work while at the same time distancing herself from bad advice:

> When I think about it, I know that I should have been more assertive when talking to men at work. I shouldn't have accepted their rejection to my requests. Also, I regret listening to the advice of some people. You know the people who would tell me what I can and cannot do. I lost so much time listening to unwanted advice and I realized that it's only up to me to decide what do I want to do. So now, I don't really care about what others think about me and my skills. I just do what I think will allow me to grow in work and business. Once I stopped listening to them, I started growing. Especially since some people hold you back. So now I am very selective with the people that I want around me. Both men and women as they both can affect you negatively. (FIDA)

In hindsight, the participants further discussed the different ways they would have dealt with the people around them. Specifically, the participants stressed the importance of having the right people around in order to develop and move their career forward. For example, NADA shared:

> It's not an easy journey, especially not when you have to do it by yourself, without any guidance. If I had to start again, I would have surrounded myself with more experienced individuals. I would have reached out for more people and sought their advice. I think that would have helped me navigate my career in a better way. This is why mentoring is so important. At that time, I didn't know its importance and my environment was very limited. Now I know the importance of building your network and connection and being exposed to different ways of leading your career. (NADA)

SAMAR and JANA further reiterated the importance of building your own network and how they should have been more opportunistic when it comes to building relationships:

> You know there are a lot of people at work who focus on networking and engage in self-promotion. I was never that way. I do regret it a bit, because I know that if I worked on building relationships with senior management and with other key individuals, I might have reached a different level in my career. It is very important to be present and in some cases, be a bit opportunistic when it comes to expanding your connection circle. (SAMAR)
>
> In general, I always discussed any accomplishment in the plural. I never took credit for my own work. I think to some extent I was demeaning myself a bit. I should have been more confident and more direct with respect to what I have done. One thing I learned in Techwomen, is the importance of promoting yourself and your skills. There is nothing wrong in saying that you know how to do things and that you are good at it. (JANA)

Similarly, NAY explained how she would have been selective in the ways she could promote her skills and know her boss as to not fall into the trap of shouldering most of the work:

> At work, my boss saw how enthusiastic I am to work and to learn, so he started giving me extra work to do. Even if I didn't know how to solve the issues, I used to always challenge myself so I can prove to him that I am capable. I think I overdid it with my self-promotion. In the long term, this definitely wasn't for my

> advantage. I would have done things differently now. I would be more cautious with what I promote. (NAY)

Similarly, RASHA shared how she would have approached relationship building differently:

> I think, in general as women, we are good at relationship building within our team, but it doesn't go beyond that. We don't reach out to external members as much. I know I am not very good at that. Partly because of the other responsibilities that I have. For example, when I became interim chair at the hospital, I would be invited to a lot of gala dinners. So, I made a conscious decision not to go to anyone, because my time won't permit and I wanted to treat everyone equally. That was a big mistake. I think I could have approached it differently, by going to different galas each year. I think that not going to these event and networking has created a distance between me and other people that are important stakeholders. (RASHA)

Reflecting her experience as a business owner, REEM went on to discuss how she would have been more cautious in selecting her work partners:

> I would have changed a lot of things, mostly focused more on the partners that I chose to help me set my business. I would have read and searched more to identify the best legal expert that would help me properly register the company. I would have also started from a more financially sound place and chose the right investors. (REEM)

NADA shared how she would have sought an international experience to supplement her local experience and better position her as a business owner:

> I think what I am missing is an international experience. My professional experience has been mostly in Lebanon and I think that has placed at a disadvantage. I think I should have worked for at least couple of years internationally and get the culture exposure and then come back and start my business. I think I would have had a different outlook on things. (NADA)

Unlike participants, RASHA and AMAL's changes are more personal and close to the relationships they have at home:

> I would have had conversations with my spouse earlier. And I would not have excluded myself from so many things. I was in a period where I didn't go to conferences. So many meetings I let myself out of to be at home with the kids. And I'm not saying that I regret the time that I spent there but I think I didn't have to go that extent while my husband was attending everything. (RASHA)
>
> I would have definitely taken two years of absence of leave when my daughters were newborns. I would have spent more time with them and put the energy to balance the requirements of both my career and my family. (AMAL)

Engaging in Self-Reflection. As part of their career reflection process, the participants engaged in a more personal level reflection that was centered around the self. Primarily, the participants reflected on who they are as women working in STEM and starting their own businesses as well as the grand culture that they are embedded in.

For example, ZEINA reflected on the purpose behind her work and in some cases even doubted if her work in the technology field will leave an impact on her society:

> At one point in my career I started thinking and questioning my purpose in life. I couldn't figure out how all the things that I am doing are related to each other. I mean I built my own company, I teach at the university and I have participated in Techwomen. So, I have the technical background and I am very passionate about using technology for the social good. I know I also have the entrepreneurial and management mindset. But for me I wasn't able to see how do all these things fit together, until recently when I realized that is part of my activism all of it together. I realized that I am making a difference in the lives of the people around me. But if you had met me two years ago, I would have been in a life crisis phase, not knowing who I am. (ZEINA)

NADA also had a similar reflection and described the internal conflict that she faced after coming back from participating in Techwomen. She expressed feeling lost and lacking a sense of career direction:

> When I was in Techwomen, I was absorbing all the knowledge and trying to make better sense of it. When I came back to Lebanon, I realized that I have to change how I work in order for me to get the desired end result. This was not easy and I didn't know from where to start and how to go about the change. I struggled for almost two years, not knowing where to start. It was very challenging when you want and know your goal but you don't know how to get to it. (NADA)

For NOHA, her reflection highlighted how the challenges that she had encountered at work helped shape who she is now:

> You know I wouldn't have it any other way. I know for a fact that although my career journey was very challenging it was still very rewarding. Sometimes I think if it would have been easier if I worked for another company, but I then think otherwise. I am who I am now because of all what I had been through. Now I know what is it that I enjoy doing and what are the things that I don't. I mean nowadays things change so quickly and we have to be able to adapt to them. Working in STEM is very important because you can be part of that change and capable of improving things around you. Career is something that shapes you as a person. It is not just something you have on the side. (NOHA)

In the process of self- reflection, some of the participants clarified what their careers mean to them. For example, FIDA thought of her career as similar to a video game:

> I feel like my career is a video game. I feel like I'm a glitch in a video game. I am a woman working in technology, starting her own business and is trying to make change in the environment around her. I guess then that makes me a glitch! (FIDA)

For JANA, her perception of herself, as a woman wearing the hijab who works in the technology sector and is a master code, translates into her capacity to work towards the impossible:

> My education was in a religious oriented university and I was the only woman in class. I was determined to work in the technology sector and to become

> independent. I didn't let my hijab or the fact that I am a woman stop me. I think "making the impossible possible" accurately describes my career. After graduating, I was able to get a scholarship to study at AUB, a dream university for me and then I was able to participate in Techwomen. These are major things in my life that happened because of my hard work. (JANA)

As to MAY and RAND, their reflection on their careers can be characterized as one that is both challenging and highly interesting:

> When I think about who I am and what my career is, I think it was very adventurous and full of risk. But for me that is what makes it so exciting. I have never had a routine day at work, things are always changing and in motion. It feels great to be part of it. (MAY)
>
> My career was a definitely a challenge. Mainly because I was very entrepreneurial and I sought to build things that would leave an impact. I wouldn't change it for anything else. (RAND)

For SAMAR, by engaging in self-reflection, she came to realize that she is a workaholic who focuses exclusively on her engineering career:

> I now consider myself a workaholic. I have a lot of work to do and in my field, you need to stay up to date on everything. I honestly enjoy doing that. I mean maybe I am sacrificing a lot of my time but what would I do otherwise? I prefer to keep on growing and developing myself instead of wasting my time. (SAMAR)

Nonetheless, SAMAR also discussed how she takes care of her mental health in order to remain productive:

> I think it's a culture thing, but we tend to feel guilty if we take a break from work, as if we are not productive. But I don't believe in that at all. I think breaks and recharging yourself also helps with the growth. For me, I make sure that I travel every 3 months. I need to get outside my own bubble and see how other people live. This actually keeps my sanity, keeps me going and growing. (SAMAR)

As part of their self-reflection process, some participants reflected on their careers in the context of the relationship with their families and spouses. For example, NISREEN shared:

> When I met my husband, and started my family, my priorities shifted to my relationships rather than my career. I was so focused on making my relationships succeed that I think I let go of who I am as a working woman. I think that is why I am sometimes feel that my career was unrewarding, maybe because I didn't put much effort in it. (NISREEN)

AMAL's self-reflection brought back feelings of regret for not being able to spend more time with her children while they were growing up:

> In my career, I now feel more focused and that is for the soul reason that my children are adults. But previously, I have always had this void and the feeling that I could have given them more time while growing up if I wasn't working. I

have all these regrets as a mother. It is something I lack, me myself, not something that I had to do, and didn't do. It's a pleasure that I missed. (AMAL)

Further, SHIREEN shared a personal reflection on how the career of her husband and his position matter more than hers:

I always feel that I want my husband to succeed more than me. I don't know why, it might be a complex that I have, maybe because of the stereotypes around me. I know I am trying to change that, but in mind I am scared of accomplishing more than he does and I want him to be in a higher position than I would. We both work in the construction and engineering field and I don't want him to feel that I am competing with him. This is the first time I discuss this out loud. (SHIREEN)

Finally, RASHA reflected on her upbringing to make better sense of how she came to understand gender:

You know I never thought about gender growing up. I mean I have 2 older brothers, when they were 17 they went to college in the US, when I was 17, I also went to college in the US. There was never a question of "oh! But you're a girl. Why don't you stay local, why don't you go to AUB?". It wasn't a big deal, I never felt like I was treated differently while growing up. I never saw the world in that lens. And I actually used to think that what are these feminists talking about. I couldn't relate to them because growing up it was never an issue. It only blossomed into an issue when I got married and had kids. Then I started feeling the inequities and the unfairness between men and women. But at the time, you know, you don't know how to discuss these issues or ask about them because

> they are not relevant to you at the time. You are impacted by the socialization around you. I mean the role models. My role model was not a household were both partners were working and they had to figure out the childcare. My mum was always there for us and it was just never an issue as to who was going to be taking care of the kids and how are we going to manage that amongst ourselves. (RASHA)

Summary

The findings from my study allow for a deeper understanding of the career experiences of women in STEM fields in Lebanon. Specifically, I provided a detailed overview and discussion about the 5 categories and their respective properties (15) to highlight the various angles that the women's career can be understood from.

CHAPTER V

DISCUSSION, IMPLICATIONS AND CONCLUSIONS

This study explored the career experiences of women working in STEM fields in Lebanon. Before I present my interpretation of the findings, it is important for me to mention that as a qualitative researcher, I bring in my own set of assumptions to my research, and through my interviews with the 21 participants, my assumptions were definitely challenged. The women whom I interviewed demonstrated a high level of resilience and perseverance with regards to their careers. To my surprise, the women were agentic in their behaviors and took control of their own careers, albeit in different ways. The women understood the countless challenges facing them while pursuing a career in STEM; nonetheless, they chose to overcome them.

In what follows, I start with discussing the findings in relation to the literature and the theoretical framework that guided the study. I then introduce a conceptual model I developed based on the study findings and my interpretations. Following that, I discuss the practical implications and conclude with implication for theory and research as well as my study's limitations.

Discussion of Findings

Vocational Choice

As presented earlier, the vocational choice of the women in this study was a result of two influences; internal and external ones. In this section, I discuss in depth these influencers in relation to the career literature and the theoretical lens that guided this study (i.e., career construction theory).

Internal Influences. The vocational choice of the study participants was largely shaped by both internal and external influences. Most of the women attributed their pursuit for a career in STEM to their internal characteristics of *passion, initiative, commitment, and curiosity.*

While a majority of the women in this study identified passion that they exhibited during childhood to be one of the internal influences for their career pursuit, a few also discussed their passion at later stages in their lives—specifically, during their high school years when they were further exposed to STEM majors and were made aware of their career options. This finding is aligned with previous research that indicates negative classroom experiences may deter women from pursuing advanced degrees in STEM, whereas positive experiences and academic access encourage women to enter the field (Dabney & Tai, 2014). Further, some participants recognized that their passion towards their career was a result of their work engagement and being exposed to challenges and opportunities for self-development. In further thinking about their vocational choice, the women discussed the initiative they took to seek and develop their careers in STEM. As one of the internal influences that the women discussed, taking the initiative to build a career by seizing growth and developmental opportunities is key to achieving career goals in STEM. For some participants, identifying gaps in the technology and engineering spaces in Lebanon allowed them to take the lead and build their own start-ups in order to address those gaps. The participants stressed the importance of not waiting for growth opportunities to present themselves, instead, creating and pursuing them. This type of initiative is similar to the concept of self-

efficacy revealed by previous studies with STEM women. For example, Aaltio and Huang's (2007) study on women managers' careers in the information technology sector in China and Fouad et al., (2016) study on women engineers in the U.S. highlighted the high level of self-efficacy exhibited by women who persevered in their careers. In addition, this finding from my study is also connected to the career adaptability construct of career construction theory (Savickas, 1997, 2005), which explores one's ability to "look ahead and to look around, to develop the self, and, in due course, to choose suitable and viable opportunities to become the person she or he wants to be" (Savickas, 1997, p. 257).

The participants in this study also discussed the commitment needed to pursue and build a business in STEM in Lebanon. They shared examples of diligence towards growing their business, as well as their prioritization of work over any personal endeavors. The women discussed their heightened sense of commitment to their careers and daily work duties regardless of their personal and emotional states. This finding is consistent with the literature on women who persisted in engineering and scientific professions thanks to their high level of occupational commitment (Fouad et al., 2016; Tirri & Koro-Ljunberg, 2002). Nonetheless, other research points out that this occupational commitment is symbolized by constant availability and visibility that in turn reinforces the gendered assumptions about the ideal scientists and engineers (Herman et al., 2013).

Further, many of the women in this study briefly discussed how their creativity led them to choose a career in technology where they could be innovative in responding

to the industry's challenges. This finding is consistent with previous research indicating that for some women in engineering and science, their motivation to develop their careers is linked to the novelty and challenges associated with it (Buse et al., 2013; Feist, 2006; Tate & Linn, 2005). These descriptions of internal influences are reflected in the career construction theory, the theoretical framework that guided this study. In this theory, Savickas (2005) explained how careers are developed over a lifetime as people make choices based on their own objective and subjective goals and realities. Consequently, careers are created based on a process of understanding oneself in relation to the world of work and one's role in it.

External Influences. A more nuanced, yet important finding from this study was the women's recognition of the diversity of external influences on their vocational choice. The women discussed the influence of their *families, school, manager, and their international exposure* on their careers. Most of the women understood that their career choices are dependent on various relationships that they had built with their family members, their schools, and their managers. This understanding enabled the women to identify the most influential members of their community who impacted their vocational choice, in most cases, their parents. The women recalled their involvement in their parents' work, citing examples of going to construction sites with their fathers when they were young, and watching their mothers lead in their own jobs. In addition to their involvement with their parents, the participants also discussed how their parents' work ethics and their desire to achieve more motivated them to seek a career where they could grow and exhibit those characteristics themselves. Adya (2008) found a significant role

of the parents and family in the choice of IT careers for south Asian women. Similarly, Duberly and Cohen (2010) discussed how a woman's career capital, including parental support, acts as an encouragement for her to seek a career in science. This parental influence was not in isolation of other influences that the women received from other family members. Unique to this study though, my participants noted the positive influence that an uncle or a brother or a spouse made on their careers. As an example, one participant shared how her entrepreneurial career began after her uncle planted in her the thought of starting her own engineering business. Some participants had an early exposure to technology and computer science because of their brothers. The role of the extended family in the careers of some participants can be easily understood considering the collectivist nature of the Lebanese culture and the tight-knit relationships that family members have in Lebanon (Afiouni, 2014).

Nonetheless, not all of the participants recognized the positive influence of their families on their career pursuit. For instance, one of the participants shared how her own desire to pursue a career in engineering was not well supported by her parents who wanted her to pursue a career in medicine. In another example, the acquisition of a degree in engineering was regarded to be enough of an achievement for one woman whose mother preferred her focusing more on her personal life than on her career. In addition, some of the women discussed the absence of any career discussions in their households and described their career decisions as an outcome of "momentum." This lack of career guidance was not restricted to the women's homes; it extended in the school context. The participants noted the lack of career guidance and planning services

at their schools and how it had influenced their vocational choices and made them alternate between university majors before they could choose one to their interest. This lack of career guidance, though, was in some cases, toppled off by some teachers who inspired the interest of some women in STEM disciplines. The role that the school plays cannot be downplayed when it comes to understand an individual's academic interest, which eventually translates into a career interest.

Another external influence that the women in this study discussed was at the organizational level. Most of them identified the support they received from their managers for career development. According to the participants, their managers' confidence in their skills and knowledge empowered them to seek new challenges at work. In addition, the women recalled the countless discussions they had with their managers and the personal encouragement that they received to advance their careers. In essence, the women highlighted the importance of having a good relationship with their managers and building their own network internally. This finding reinforced previous research that workplace support affects the retention of women in the engineering field; when managers demonstrated greater understanding of work-life balance and provided more career advancement opportunities, women likely persisted (Fouad et al., 2016).

Lastly, another important external influence discussed by the women in this study is related to their international experiences and exposures. Several of the participants who work in the technology space, described the impact of the Techwomen program they attended. They shared stories of working in international laboratories and with high-tech firms in the Silicon Valley in the U.S. and the leadership lessons that they

learned. For some participants, such international exposure was an eye-opening experience, which enabled them to make a positive impact on the Lebanese community to which they belong. This finding is significant in that previous research has barely recognized the role of international exposure in women's careers in STEM. This contribution can be further elaborated by the importance of giving women international opportunities to expand their ways of working and learning.

Finally, the findings from this study suggests an interdisciplinary connection, specifically with Gerson's (1986) work. Gerson examined, nearly four decades ago, why women chose to pursue one goal over another and called for the need to look at how women's motives, goals, and capacities develop as they move through their different life stages. These various influences, whether internally or externally, take place across different career stages of the women and are not solely restricted to childhood.

Career Accomplishments

The women in this study shared their career accomplishments as STEM professionals. They were especially insightful when reflecting on how much they had accomplished, both professionally and personally. In particular, the women discussed their achievements in terms of *job performance, self-development, recognitions* they received from others for their work, and the *impact* that they made on their communities. The participants offered concrete examples to illustrate how their performance–whether in leading meetings, securing a deal, or promoting their business–was a major pride for them. They realized that even though they work in male-dominated industries, they are able to outperform their peers and be a change catalyst within their organizations. This

reflects a high level of connectedness that women engineers had with their occupations and their strong engagement in their work, as found by Buse et al. (2013). Staying in the professional context, the women also shared how being recognized for their work and skills was an indication of their high importance. Some women noted their work in STEM was valued by their clients, managers, and even their own alma matter. For my study participants, it was highly rewarding to establish a reputation as a subject matter expert in their fields, and to be sought after for consultancy work. This aligns with Hass et al.'s (2016) finding that women in science construct their professional identities around aspects of excellence and hard work, and that they refer to the need to permanently strive for scientific recognition. Scientific recognition was found to predict lifetime productivity for women in STEM (Feist, 2006).

Another career accomplishment that the participants shared is the impact that they are making on others through their work. In the technology industry, for instance, the women gave examples of how leveraging technological tools and teaching coding as a skill would empower the youth and advance the development of rural communities in Lebanon. Previous research tends to focus on the altruistic career goals of women in science (Carlone & Johnson, 2007), especially pertaining to the women's interest in solving important health issues and helping humanity (Feist, 2006), but it fails to look at the altruistic career goals behind women's pursuit of careers in technology. This study filled in this void by providing a more nuanced understanding of the women's desire to impact the technology ecosystem in Lebanon—they did so by equipping youth, including girls, with lifelong skills such as coding and technical skills development.

Another finding from this study that has not been documented in the current literature relates to the impact that the women desire to make outside of their STEM careers. The women not only noted the larger influence they are having on their communities, but also discussed a more personal impact that they are leaving on their children. As working mothers, some of the participants discussed how they were able to demonstrate values of independence and perseverance to their children. At the same time, the women also discussed their own self-development and growth as part of their career accomplishments. The participants in this study recognized the effort it took to develop their skills and knowledge in order to become experts in their own fields. These efforts later led to the women's success in securing a desired job or participating in STEM programs (e.g., acquiring a degree in STEM education), which is highly valued by the Lebanese society.

Career Challenges

The career challenges associated with the career experiences of women in STEM in Lebanon, as reported by the women in this study, are multi-fold and encompass the *institutional context, resource scarcity,* and the *gender stereotypes.* These career challenges were part of the larger career context in which the women actively tried to make sense of their experiences while working in the STEM fields.

Institutional Context. The institutional climate is a vital consideration for understanding underrepresented groups in STEM (Charleston et al., 2014). In this study, the institutional context (organizational, cultural, and legal systems) reflected the prevalence of a gendered culture that is unwelcoming of women and is dictated by rigid

gender norms. This was exemplified by women's countless accounts of gendered-bias treatments both on-site and in the office, being marginalized for their opinions, being evaluated based on an idealized masculine criterion, and being perceived as unfit for a STEM job. In an academic setting, some of the women discussed how the traditional view of the male as the breadwinner of the household prompted their department head to allocate summer teaching opportunities to their male colleagues and not to them. This experience was also shared by another woman physician who noted her department's salary metric was biased towards men and as some male physicians claimed, women should not be blamed for lack of negotiation skills. These findings are supported by multiple studies that have highlighted the gendered dimension of the organizational culture in STEM fields. The IT industry, for example, was found to be institutionally constructed with gendered dimensions that further participated in the creation of femininity and masculinity (Aaltio, 2006).

Further, in STEM careers, the salience of a masculine understanding and notion of the profession and its career models (e.g., Bird, 2011; Britton, 2012), powerful male networks that are disadvantageous to women in informal selection and promotion processes (e.g., Van den Brink & Benschop, 2012), and denigration and stereotyping of feminine qualities, further perpetuated traditional masculine work cultures in STEM workplaces (Barnard et al., 2010) and isolate the female minority. The study participants discussed how the prevalence of the gendered organizational culture contributed to a lack of work-family policies. For most of the working mothers, the absence of flexible work arrangements, including teleworking, was a major cause of

stress that resulted in significance career derailments. The participants described the image of an idealized masculine worker to which they are constantly compared, with a complete neglect of their motherhood duties. As Williams and Ceci (2012) suggested, STEM employment is less conducive to family building than other professions and that male STEM coworkers hold more conventional gender expectations relative to other college-educated men (Sassler et al. 2017). Women, especially mothers working in STEM, perceive an organizational culture that is less positive and supportive. Other elements of the organizational system that were considered to be challenging for the women in this study included workplace harassment, bureaucracy, and nepotism. Nepotism is rarely discussed in the literature on women in STEM, although it is sometimes alluded to when the focus was on exploring the career challenges of women in other fields, primarily in an eastern country context (Ozbiligin & Healy, 2003; Sidani & Thornberry, 2013). This is interesting because it sheds light on the complexities of issues that women face while pursuing careers in STEM. These challenges, as discussed by the participants, are reflective of an organizational culture in Lebanon that discourages women from seeking employment.

In addition to the organizational system, my study participants also tapped into the Lebanese culture to give more insights about the challenges they had experienced. Most of the women discussed the patriarchal culture to which they belong and the influence it had on their own perception of gender roles. In most cases, the women noted how gender roles were internalized in their own behaviors both at home and at work. Gerson (1986) discussed these gender roles and more specifically the gender inequality

that arises from them, as part of a differential socialization that takes place between the sexes. Women recognized that they were performing most of the household duties and at the same time are expected to work at full capacity in their jobs. Patriarchal characteristics were thus seen and felt both at home and at work, and were further translated in to the unconscious bias that affected the women who desired to pursue a career in STEM. The women in this study gave examples of how their male colleagues thought less of their capabilities, mainly because of their gender. Similarly, the unconscious bias was also exemplified by family members who encouraged the women to seek an occupation (e.g. teaching, nursing) that would allow them to attend to their motherhood duties. In other words, considering that STEM occupations are characterized by the masculine nature, the women were motivated to seek more feminized jobs, which further perpetuated occupational gender bias.

Another cultural element that presented a challenge for women in Lebanon is the perception of job security. Women who decided to start their own businesses and to be freelancers were apprehended for their decisions by their family members and others who viewed these women as taking uncalculated risks of leaving secured jobs for unstable ones. Nonetheless, the women persevered in their decisions and refrained from succumbing to the cultural pressure of following a 9 am-5 pm job. This perseverance is a unique contribution from this study, as women are not seen to be risk takers; instead, they are expected to pursue jobs that will give long-term security to them and their families. As will be shared in the next section, women in this study did seek self-employment, disregarding the internalized concept of job security that is prevalent in

Lebanon. For these women, the desire for innovation and liberation trumped the need for job security.

Another cultural challenge as revealed by this study is the Lebanese community's view towards working in the humanitarian sector. One participant explained that she had to educate her community about the seriousness of humanitarian work, especially the importance of leveraging technology to advance the community. The last element of the institutional context that the women discussed was related to the Lebanese legal system. This is another unique finding as it pointed to the deficiency in the legal system in Lebanon that was difficult to maneuver particularly for the women entrepreneurs who were starting their own businesses. More than half of the women in this study are entrepreneurs and they all discussed the difficulty in understanding the legal processes that they need to follow to set up their businesses. They recalled ill advice that they received from their lawyers and described how the legal system itself is mostly designed for large corporations and biased against start-ups, specifically, start-ups led by women.

Resource Scarcity. The institutional context was only one of many challenges that the women faced while working in STEM fields in Lebanon. The other major challenge was related to resource scarcity– both financial and human– that the women had to grapple with while working. In general, the women discussed the difficulty in securing the right investment and in raising the adequate amount of money needed to launch their start-ups. This was in line with what they denoted as the "pre-mature" investment climate in Lebanon. As my study participants mentioned, this challenge was further exacerbated by lack of trust that some angel investors and/or venture capitalists

have in women entrepreneurs. In addition to deal with gender bias with respect to securing investment, the participants also experienced difficulty in raising money in certain fields such as the humanitarian sector. One participant explained the lack of sensitivity from investors towards the technology service that her company provides to the youth, consequently, making it difficult for her to secure the needed financial capital. For other women, the lack of financial support from their own organizations, for example, in a medical institution, was manifested by difficulties in recruiting highly talented female physicians and lack of competitive compensation packages. Further, one associate professor in computer science shared how the lack of funding for her laboratory left her facing stringent tenure requirements with minimal resources at hand. This finding about resource scarcity is new to the literature.

Other than the financial resource scarcity, the women also alluded to the human resource scarcity as exhibited in the lack of career guidance and mentorship. Most of the women centered their discussion on the lack of mentors and mentorship opportunities, which left them exploring their careers on their own and seeking advice informally. This aligns with Ahuja's (2002) findings that the barriers to female senior positioning in the IT industry are due to the lack of female role models and mentors as well as established discriminatory practices. The women in this study realized the importance of mentors after some of them had the chance to participate in an international program (Techwomen), and benefited from a mentoring relationship that they had experiences. For my participants, proper mentorship dyads meant gaining access to their own fields' network and ecosystem as well as receiving advice and insights regarding how to

develop their careers. In spite of the lack of formal mentoring, my participants took the initiative to identify alternatives seeking other sources of knowledge, including reading, attending conferences, and engaging with other local start-ups in order to stay current and to learn from others' experiences.

Gender Stereotypes. Lastly, the third major challenge that the women in this study discussed was related to the gender stereotypes that they had to face both at work and at home. When examining challenges for female managers who are employed in IT, Liu and Wilson (2001) noted several obstacles including the gender stereotypes and attitudes, family responsibility, working time constraints, and lack of confidence in women. The women in this study were highly aware of these stereotypes and were able to articulate them as related to their skills, age, and their motherhood status. They had to constantly prove that they are competent enough to carry out their work. To do so, the women would challenge long-held assumptions about their capabilities and would push the limits of gender bias. In addition to proving their skills, the women had to work harder than their male counterparts in order to be taken more seriously. The women knew that they are being compared to a masculine standard and they needed to deliver impeccable work to gain the trust of their managers. This reflects the combined attitudes and expectations of coworkers and supervisors who hold more traditional beliefs about the competencies and performance level of women in STEM fields (Glass et al., 2013). This perception of women was also found by other researchers who note that women who work in STEM encounter resistance from co-workers, subordinates and superiors;

they are viewed as anomalies, and as women first, engineers second (Faulkner, 2009b; Miller, 2004).

Further, the women also suffered from a motherhood penalty as another form of gender stereotypes. The participants discussed the added layer of complexity that they had to face as both a woman and a mother working in STEM. The assumption was that as working mothers, women would shift their focus from their job to their families– highlighting how STEM organizations may be designed in ways that stimulate men's but not women's productivity, particularly women with family care responsibilities (Stone, 2007). On a more personal level, the women shared examples of how their young age became a barrier for them to acquire jobs and to gain trust from their clients. The notion of ageism (the bias against someone because of their age) was widely experienced by my study participants and adds to the literature the multitude of challenges that women face in their STEM careers.

Gender stereotypes were also displayed domestically when the women in this study discussed the assumptions and expectations that their spouses had regarding their duties at home. Some husbands made it clear to the participants that both household duties and child caring were women's responsibility, disregarding their professional work. In these instances, the women questioned the gender role assumptions and their impact on both personal and professional levels. These more intimate gender stereotypes were quite evident in the participants' narratives. Further, the women–deemed to be responsible for child care–also noted the stereotypical attitudes towards them when it comes to their decision-making regarding different models of childcare. Some women

considered seeking external help as the most suitable solution for them as working mothers, while others regarded child care as a very personal matter and thus preferred not to 'outsource' it. In either way, the women would face backlash with regards to their decision about child care; all of which further contributes to a larger gender stereotype scheme. This finding–different models of care– has been rarely discussed in the literature on women in STEM and expands our understanding of the more intimate and laborious challenges facing women. These challenges are closely aligned with the career construction theory that takes into consideration the changing environment through which an individual continually navigates. The theory pays attention to one's social, cultural, and personal contexts that underscore career construction and provides a better understanding of the dynamic and complex interactions that occurs in one's environment (Savickas, 2005). In addition, women's career challenges have been discussed early on by Gerson (1986) whose book goes into detail about how women decide about work, career and motherhood. Her findings, while almost four decades old, are still relevant to this day.

Coping Strategies

Realizing that the challenges that they faced are embedded in their organizations and homes, the women adopted specific coping strategies to counter the negative effect and allow them to reach their career goals. Generally speaking, the coping strategies are multi-directional and are intended to lessen the challenges and to create change both at work and at home. Three specific coping strategies were adopted by the study participants, including *managing one's own career path, engaging in change*

management practices, and *managing conflict.* The undertone of each of these coping strategies can be characterized as the women's diligent efforts to pursue their careers amidst all the challenges they face. The women in this study made it clear that their careers in STEM would only develop if they challenge the gendered and masculine system embedded in the private and public spheres. Coping strategies were thus central to the discussion of the career experiences of these women.

Managing one's own career path. As previously mentioned, one of the coping strategies that the women adopted was the conscious effort to manage their own career by either becoming entrepreneurs or adequately taking more control of their own career paths. One finding from this study that is not documented in the current literature is that some women opted for an entrepreneurship career path as a means to address the challenges that they faced. The women charted their own careers and took an entrepreneurial turn that allowed them to create and develop their own start-up organizations. Also, realizing the vast potential in the technology ecosystem in Lebanon, some of the women designed technology initiatives that would allow them to put their skills to use and leave an impact on their communities. In addition to leveraging their own skills outside the formal employer-employee scheme, some of the women realized that their career growth would be halted if they stayed bounded to an organization. In this way, embracing entrepreneurship and self-employment became a means to reduce the negative impact of gender bias in SET training and employment (Martin et al., 2015). However, for the rest of the participants, entrepreneurship is still an idea that they were

considering; and to prepare themselves to become entrepreneurs, the women were actively building their skills and pursuing education.

Other than becoming entrepreneurs, the women also discussed taking control of their careers, relationships and the expectations of others. Primarily, the women realized that growing their careers and attaining the desired job required them to be proactive in their decision making. After gaining some working experience, the women now know what types of jobs they prefer to have. For some, the desire for a flexible schedule and an engaging environment prompted them to only seek jobs that would meet these desires. For the women entrepreneurs, taking control of their careers meant understanding the Lebanese market and tailoring their business offerings to their Lebanese clientele. On a personal level, the women also discussed taking control of their relationship with their spouses and clients by setting the expectations regarding their work responsibilities. They shared examples of conscious efforts to defy cultural norms regarding being a career woman in STEM as well as using their gender to their advantage. One might consider this tactic as 'gender ownership'. In this strategy, women could emphasize and capitalize on the strengths that being a woman may bring to the engineering role. As women engage in gender ownership strategies, over time these interactions may alter the culture, so that gender will no longer be categorized in terms of good or bad in engineering, but instead simply as different or even complementary (Hatmaker, 2013).

Engaging in change management practices. Another coping strategy that the women adopted was geared towards change management. The women realized that the

challenges that they faced will apply to other women who either currently work in STEM or plan to pursue a career in these fields in the near future. As such, their coping efforts were future-oriented and were intended to influence HR policy making, empower other women, and build trust with colleagues. The women in this study actively participated in gender task forces across their organizations, and served on committees that determine compensation packages, as ways to influence HR policy making. When establishing their businesses, the women entrepreneurs made diligent efforts to alter their HR systems, especially focusing on recruitment, in order to attract more women to the business. They focused on making their job advertisement more appealing to women and offered flexible work arrangement policies.

Further, recognizing that they were not able to benefit from mentorship relationships or follow the footsteps of a role model, the participants decided to fill in the gaps and empower other women who are seeking a STEM career or currently working in STEM. Unlike previous research that highlights women distancing and disassociating themselves from other women, thus adopting a gender-neutral professional identity (Ibarra & Barbulescu, 2010; Powell et al., 2009, 2012; Rhoton, 2011), the women in this study sought to support other women in various forms (e.g., HR policy making and mentoring), working towards dismantling the barriers of entry to STEM professions for other women. For example, one entrepreneur who owns a technology industry company, decided to provide 100 hours of free advisory sessions to help other women who are working in the technology sector. One woman physician offered mentorship dyads with her colleagues to help other women. Further, some participants expressed empathy and

understanding of the circumstances of their female colleagues and therefore, gave them more flexibility in the ways they carry out their work.

More concretely, some participants who work in the engineering sector made an effort to organize conferences to showcase women's achievements in the technology fields and provide a platform where women could share their skills. In addition, another woman engineer created a committee within the Syndicate of Engineers in Lebanon to further promote women's work and to create a solid network of women professionals in engineering. Similar initiatives were also put forward by women working in technology, who designed activities that would empower young girls to consider a career in technology. All these efforts made aimed to prompt women to seek careers in STEM and provide a support system. In another attempt to engage in change management, the women were able to cope with their challenges by building and gaining the trust of their colleagues. This effort was mainly to establish a woman's credibility as a subject matter expert in her field and be recognized as the go-to person.

Managing conflict. Lastly, the participants discussed three ways in which they were able to manage conflict at work, home, and in some cases the intersection of both. They are *adapting to their situation and organization environment*, *confronting*, and/or *seeking support from family members and others*. In terms of adapting, some participants shared examples of accepting the bureaucratic system that exists in their organization and came to accept the fact that they were unable to change it. For instance, a woman physician explained how being a minority in her medical institution had limited her ability to initiate change, so she found it easier to just accept the status quo. For many

participants, examples of a hostile organizational environment that is dominated by men left them feeling hopeless of any possibility for change. Consequently, these women chose to adapt to their organizational culture and try to fulfill their career aspirations within the set boundaries (see Herman et al., 2013; Orser et al., 2012; Powell et al., 2009). By not challenging existing organizational structures, these women are perpetuating a hegemonic masculine culture rather than creating impetus for change (Crump et al., 2007; Hatmaker, 2013).

However, for some other participants, adapting existing gendered organizational culture was simply not an option. This group of women chose to confront the masculinized and patriarchal organizational systems that they faced, similarly to women in other studies (Hatmaker, 2013, Martin et al., 2015). The women in this study shared examples of their diligent efforts to counter the stereotypes against them. They also refused to let their gender dictate the kind of work that they could do. As a concrete example, one assistant professor in computer science discussed how she challenged her university administration regarding whether or not to grant her tenure pause after childbirth. Expectedly, women entrepreneurs had to brush of critics who regarded them as incapable of running businesses. In the entrepreneurship context, this might be perceived to mimic the socially designated role of "women as nurturers", a role potentially incompatible with the more self-actualizing depiction of the "ideal entrepreneur" (Henry, Foss & Ahl, 2016; Rowse, 2014). The women understood that only by confronting would they be able to cope with various gendered norms.

Further, in order to cope with the demands at both work and home, the women resorted to seeking and building a support system around them. My study participants discussed support they received from their parents and in-laws in the areas of childcare and other domestic duties. Some gave examples of the support they received from their spouses who shared household tasks to allow their partners to focus more on their work. Perceptions of a supportive social environment lead to women's positive beliefs in success in a STEM career and increased women's motivation to pursue a STEM career (Buday et al., 2012; Ferriman et al., 2009). This finding highlights that the domestic environment is an important factor that must be taken into account when examining why women choose a STEM career and persevered. As an example, one physician discussed the support she received from her children's nanny when she was completing her medical residency in the U.S. She credited her ability to focus on her studies and work to her nanny.

The employment of these coping strategies can be found in the career adaptability construct of the career construction theory, which explains how people cope with occupational transitions and work changes. Savickas (2005) defines career adaptability as "a psychosocial construct that denotes an individual's readiness and resources for coping with current and imminent vocational development tasks, occupational transitions, and personal traumas" (p. 51). As such, the women in this study clearly fit into Savickas and Porfeli's (2012) description of adaptive individuals—those who can be characterized by four 'adapt-abilities,' frequently referred to as the 4Cs (concern, control, curiosity, confidence). All the women in this study displayed *concern*

about their vocational future. They took *control* of their career path by making an effort in preparing for their vocational future. They displayed *curiosity* by exploring possible selves and reflecting on their careers; and they experienced a strengthened *confidence* to pursue their aspirations. This belief was found to be consistently highlighted within the sub-construct of career adaptability and in the use of career narratives as a process for self-reflection, career and life planning, and personal action (Savickas, 2002, 2005).

Outcomes of coping strategies. Different from other studies, my participants offered some insights into the outcomes of the coping strategies that they had adopted. For example, they shared the positive outcomes resulted by pursuing an entrepreneurial career path. They specifically discussed the difference they were able to make in the community where they live. Further, one women shared how she now has a better relationship with her client, after she confronted his gender-biased behavior. However, not all the outcomes of the coping strategies were positive. For some women, their desire to change internal organizational processes were met with apprehension; and as a result, they did not achieve their intended goal. This speaks to the distribution of power and gendered institutional structures that limited the women's ability to initiate change. This also speaks to the negotiated process whereby women confront and respond to the constraints and opportunities, encountered over the course of their lives and careers (Gerson, 1986).

Career Reflection

Engaging in reflective practice was key to the women in this study because it allowed them to develop a deep understanding of how their careers unfolded and what

they *could have done differently*. This finding is very important as it gives a more personal perspective about the women's own reflection and thinking. This reflective practice was apparent in what the women thought would be different in their careers. Most of my participants wondered what would have changed if they believed more in themselves and trusted their own ability to push their careers forward, while at the same time stopping to take things personally and understanding that feedback from others can be constructive.

The women also shared that rather than being a victim of bad advice and influence, they would have preferred to surround themselves by the right people who would direct them towards their goals. This reinforces the importance of building a network of trusted friends and mentors and being present in events and meetings in order to further networking (Metcalfe, 2007). Other things that the women would have done differently with regards to their careers including selecting the right business partners and building relationships outside of the work. On a personal level, some women would have preferred gaining some international work experience prior to starting their own businesses. In hindsight, some women wished they had conversations with their spouses much earlier regarding the division of domestic work; and others wished they had stressed the importance of their own work, or taken a longer maternity leave or even requested a leave of absence from their academic job to take more diligent care of their children.

The participants shared specific areas they reflected on, including their identity as a career women in STEM, the national culture, and the businesses that they started. In

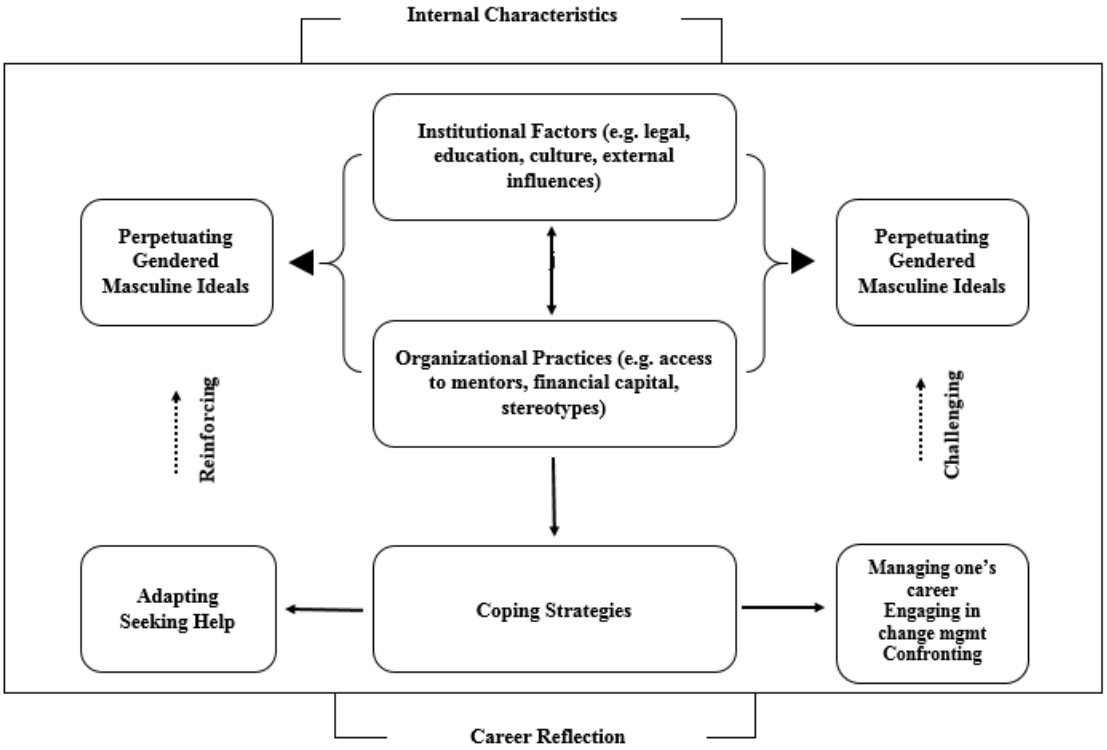
many instances, the women questioned if their work would leave an impact and if they would be able to make changes in the technology ecosystem. For some, the lack of career direction left them feeling lost and at times questioning their own work. Nonetheless, acknowledging the challenges that they were constantly facing, the women discussed how proud they were as women working in STEM and being able to pave the road for other women in their own industries. The women also gave intimate examples of how in some cases they had to put more effort in the relationships with their spouses and children at the expense of their careers. This led them to feel unfulfilled in their careers and regret investing so much energy in their household duties and disregarding their careers. The women attributed such a feeling to their gendered upbringing that emphasized the acceptable norms of behavior for women. Critical reflection was key for the women in this study to begin to develop a sense of self-awareness, which led to a productive, positive, and new understanding of their careers. This finding is closely aligned and consistent with the life theme construct of the career construction theory CCT in that one's career narrative is constructed from self-reflection, particularly during times of disorienting events (Savickas, 2005, 2011).

Conceptual Model

Based on the above discussion, I developed a conceptual model (see Figure 4) integrating the institutional factors and organizational practices to illustrate the dynamics of the relationships between the two and how they may collectively influence career experiences of women in STEM fields in Lebanon. The model is bounded by the internal characteristics that a woman should embody to pursue a career in STEM as well as the

constant career reflection that she would be engaging in throughout her career. Specifically, I argue that organizational practices such as performance appraisals, availability of mentors, and access to network and financial capital are gendered and reflect the institutional context of Lebanon (i.e., the legal system, capital market, education system, culture, and external influences), which act as constraints to women's career progression in STEM fields. The organizational practices evolve as a consequence of the never-ending interplay between changes in the institutional context and the larger macro environment. This interplay perpetuates a gendered and masculine ideal with respect to STEM employees. Against this backdrop, the model extends our understanding of the career experiences of women in STEM in Lebanon by revealing the strategies that the women adopt to cope with the outcomes of the previously discussed interplays between the institutional factors and the organizational practices. The various coping strategies that the women use reinforce, reproduce or challenge the gendered and masculine ideal in STEM, as denoted by the dotted arrows.

Figure 4. The dynamic experience of women's careers in STEM: A conceptual model



Implications for Practice

The findings from this study have broad practical implications. I will discuss them at two levels—national and organizational.

National Level

At the national level, policies or a boarder educational and vocational agenda can be developed by the government to communicate its commitment to the advancement of STEM and women's participation in these male-dominated fields. A national STEM policy would then span the education, research and development sectors, and allow local governmental agencies to develop relevant programs in relation to innovation, employment and industry development. In this section, I discuss in details the

implications at the educational level, followed by a discussion about how a national level strategy can also be set to encourage and support entrepreneurs in STEM.

Educational System. School counselors and teachers should become more aware of the 21st-century STEM career opportunities and skills in order to prepare their students (both male and female) for the jobs of the future. This includes promoting STEM education and careers at all school levels and collaborating with universities to further increase the awareness of STEM majors and disciplines. Early exposure to STEM disciplines, at the school level, will provide students with the opportunity to explore different fields of studies, which will later on facilitate their pursuit of a particular career. As such, it is necessary to create awareness campaigns to enhance the public understanding of career options in STEM and the nature of STEM work, and to inform students of the range of possible future STEM careers.

Furthermore, schools are in a unique position to educate parents as well. As confirmed by the participants in this study, parents play a major role in influencing the careers of their children. Therefore, schools should work in collaboration with parents and provide them with necessary information regarding various educational pathways that their daughters can purse. It is essential that school administrations develop strategies to engage parents in STEM education and in building positive attitudes to STEM-related careers. Close collaboration with the parents is of great importance for further encouraging girls to study STEM and pursue a career in one of its fields in the future.

In addition, greater efforts should be made to foster a welcoming STEM environment for female students. For example, educators should invest more time and energy in designing STEM curricula that are attractive to women. In addition, it will be helpful to pair school girls with successful career women in STEM because having role models will show school girls the possibility of pursuing a STEM career. Students can meet STEM professionals through face-to-face interactions or the virtual environment (e.g., e-mentoring). Nonetheless, schools should also be cognizant about the implicit bias that might be held by teachers regarding girls' interest in STEM fields because teacher biases and attitudes has a direct impact on students' perception on STEM and their career orientations. To this end, offering training programs that focus on implicit bias may be an effective way to address stereotypes and beliefs that teachers may not be aware of.

Entrepreneurship Support. Entrepreneurship is considered a fundamental driver for economic growth in both developing and developed countries. In this study, an entrepreneurial approach was adopted by women as one of their coping strategies in response to the myriad challenges that they encountered. This finding has implication for the entrepreneurship ecosystem as it signifies the changing landscape of women's employment and allows us to think of different approaches that women may take to establish a career in STEM. For entrepreneurial endeavors to succeed, a solid infrastructure for the ecosystem must be in place. This includes laws and regulations, financial resources and human capital. Specifically, at the government level, laws and regulations governing business start-ups should be formulated in the manner that both

men and women are encouraged, can easily understand and implement. Laws can also include potential tax incentives for new business owners, particularly female entrepreneurs. Further, access to financial capital is considered to be one of the major challenges that early entrepreneurs have to deal with. This challenge can be mitigated by creating and nurturing incubator hubs that include angel investors interested in supporting start-ups launched by women. In addition, more seasoned or established entrepreneurs can be very helpful to new or inexperienced entrepreneurs by providing intensive support and mentoring at the different stages of a new startup: pre-, during and post (Roper and Hart, 2013). Additional support to start-ups can be provided through business incubators that aims to provide business premises, advice, networking and finance opportunities (Miller and Bound, 2011).

Organizational Level

As my study shows, women often find themselves facing a highly masculine culture within their organizations, which limits their career development opportunity and negatively impacts their work experiences. Therefore, change must begin with various STEM industries eradicating historical gender imbalances by enacting policies that address the negative influence of organizational culture and structure on the careers of women employees. For example, organizational leaders can take a lead in creating a gender-friendly policies and environment, providing flexible work schedules, and restructuring job evaluations in order to meet women's unique needs. As it currently stands, even when organizations adopt policies to support women, they are positioned as an "accommodation" framed within existing cultural assumptions rather than

fundamental work redesign for gender equity (Bailyn, 2011). Organizational leaders working in STEM fields must be mindful of the often taken-for-granted cultural norms and masculine values (Rhoton 2011), and work towards creating an authentic environment that truly promotes women's participation and career development. This can be done by focusing on understanding and eliminating explicit and implicit bias or stereotyping against women and the adverse impact of existing career systems. For example, organizational leaders and HR professionals can work on increasing the representation of women in leadership positions, as well as using cluster hiring to reduce tokenism and stigmatization. Further, recruitment and selection processes should be aligned with value for gender equality and equity. Finally, efforts must be made to reduce the ambiguity and biases embedded in current performance evaluation systems.

There is also a need for organizational leaders in STEM to work on creating a relationship-oriented culture that revolves around *mentorship and role-models*. Research has shown the positive effects of mentoring and supervisor support for women on many career outcomes: earnings, advancement, retention, job and career satisfaction, and job involvement (Allen, Eby, Poteet, Lentz, & Lima, 2004). Mentoring for women was found to be particularly effective in industries that are considered masculine such as STEM (Hart, 2016; Thomas et al., 2015). As such, organizations must invest time and energy to develop effective mentoring programs, foster collaborations rather than competitions, reward teamwork and helping behaviors and identify sponsorship for women.

In addition, leaders and HR professionals should be mindful of flexibility stigma and family structure bias when focusing on how to increase work–family resources and facilitate greater control over work hours and boundaries. To this end, organizational initiatives should encourage leaders to model balanced work–life behaviors (not overworking) and manage people without using "face time" as a proxy for performance (Kossek et al., 2017, P.239). Also, provide longer paid or parental leaves for those who share child or elderly care (with partner) to foster gender egalitarianism.

Implications for Theory

In this section, I provide further discussion of my study's findings in comparison to the guiding theoretical framework, Career Construction Theory (CCT). As described in Chapter II, CCT is based on the epistemological assumption that "careers do not unfold: they are constructed" (Savickas, 2002, p. 154). This theory is illustrated by three core components: (a) vocational personality; (b) career adaptability; and (c) life themes (see Table 5). CCT recognizes that there are a variety of individual characteristics (e.g., personality, interests) that lead people to more or less successfully integrate their self-concepts with their work role (the outcomes of which are termed "adaptation results"; Savickas, 2013; Savickas & Porfeli, 2012). Further, successful career development is seen as a continuous process of *adaptation* resulted from the successful integration of personal needs with social expectations (e.g., norms for the preparation for, entrance into, participation within, or exit from various work roles; see Hirschi, Herrmann, & Keller, 2015; Savickas, 2002, 2005; Savickas et al., 2009). Finally, CCT adopts a narrative perspective that focuses on the dynamic processes through which

people construct, deconstruct, reconstruct and co-construct their life stories, and the important life themes subsequently influence how they subjectively make sense of their working experiences.

Table 5.

Overview of Career Construction Theory (Savickas, 2002)

	Career Construction Components	**Definition**
Vocational Personality	**WHAT** different people prefer to do?	Individual's career-related characteristics such as interests, needs, skills, abilities, and values.
Career Adaptability	**HOW** individuals deal with vocational tasks and work related challenges?	The set of attitudes, behaviors, and competencies people use to cope with changing work conditions and demands**.** **Concern** (*planning*) | **Control** (*decision-making*) **Curiosity** (*exploring*) | **Confidence** (*problem-solving**)***
Life Themes	**WHY** a certain career choice is made?	Which life themes make meanings and lead to certain vocational behaviors.

Findings from this study makes unique theoretical contributions in three ways. First, the findings expand career construction theory by highlighting the important role of contextual factors in shaping women's career experiences in STEM. My study

revealed that the institutional context has inhibited some of the participants from exercising control over their careers. Also, despite being concerned about advancing their careers, the multi-level challenges that some of the women faced (e.g., gender stereotypes), made it more difficult for them to further advance their careers. Similarly, even though some of the participants expressed curiosity and were open to explore different avenues for their careers, the lack of career guidance, for example, had hindered them from reaching their highest career potential. As such, I postulate that career challenges also originate from contextual barriers that impede women's career adaptability of control, concern and curiosity. Rudolph et al. (2018) observed that current research on career construction theory does not discuss the contextual factors that shape the processes outlined by career construction theory and, in particular, the career construction model of adaptation. The authors specifically ask "How do different contextual layers, including people's tasks, job characteristics, team environments, organizational characteristics, and broader socioeconomic factors influence the relationships among adaptivity, adaptability, adapting, and adaptation?" (Rudolph et al., 2018, p. 3). Considering the above observation, this study is a timely effort. The women's context-specific challenges, rather than their attitudes, hindered their career construction, indicating that career challenges do not only originate from deficits in career adaptability (of concern, control, confidence, curiosity).

Second, findings from the study also advance existing career construction theory by highlighting the importance of the women's career stage in shaping their coping strategies. This finding extends career construction theory as it reflects both short- and

long- term oriented strategies that the women adopted at different career stages. This finding expands career construction theory by identifying time orientation as an influencer regarding on how women approach and adapt their careers. It further indicates that women express their concern about their careers by being mindful of their career stage.

Third, findings from this study highlight the role of relationship in shaping women's career decision making and underscore the relational element behind women's career experiences in STEM fields in Lebanon. This suggests that women do not construct their careers alone. Instead, the life themes that emerged from the women's career construction highlight the influences other people may have on their career decisions. For example, the women not only displayed concern about their own careers, but also expressed concerns about the careers of other women who work or aspire to work in STEM. Thus, these women resort to coping strategies (e.g., engaging in change management) that will allow them to help other women navigate their careers in STEM. This theoretical implication is also in line with Rudolph et al.'s (2018) call for more research on career construction theory that further explain career choices, behavior, and adjustment of underrepresented or marginalized groups (e.g., women in engineering professions; Fouad, Singh, Cappaert, Chang, & Wan, 2016; refugees; Newman, Bimrose, Nielsen, & Zacher, 2018). Investigating propositions of career construction theory in specific populations (as I did in this study) will advance the career construction theory and identify its boundary conditions.

Based on the above discussion and analysis, I propose a new conceptual framework of career construction (see Figure 5.)

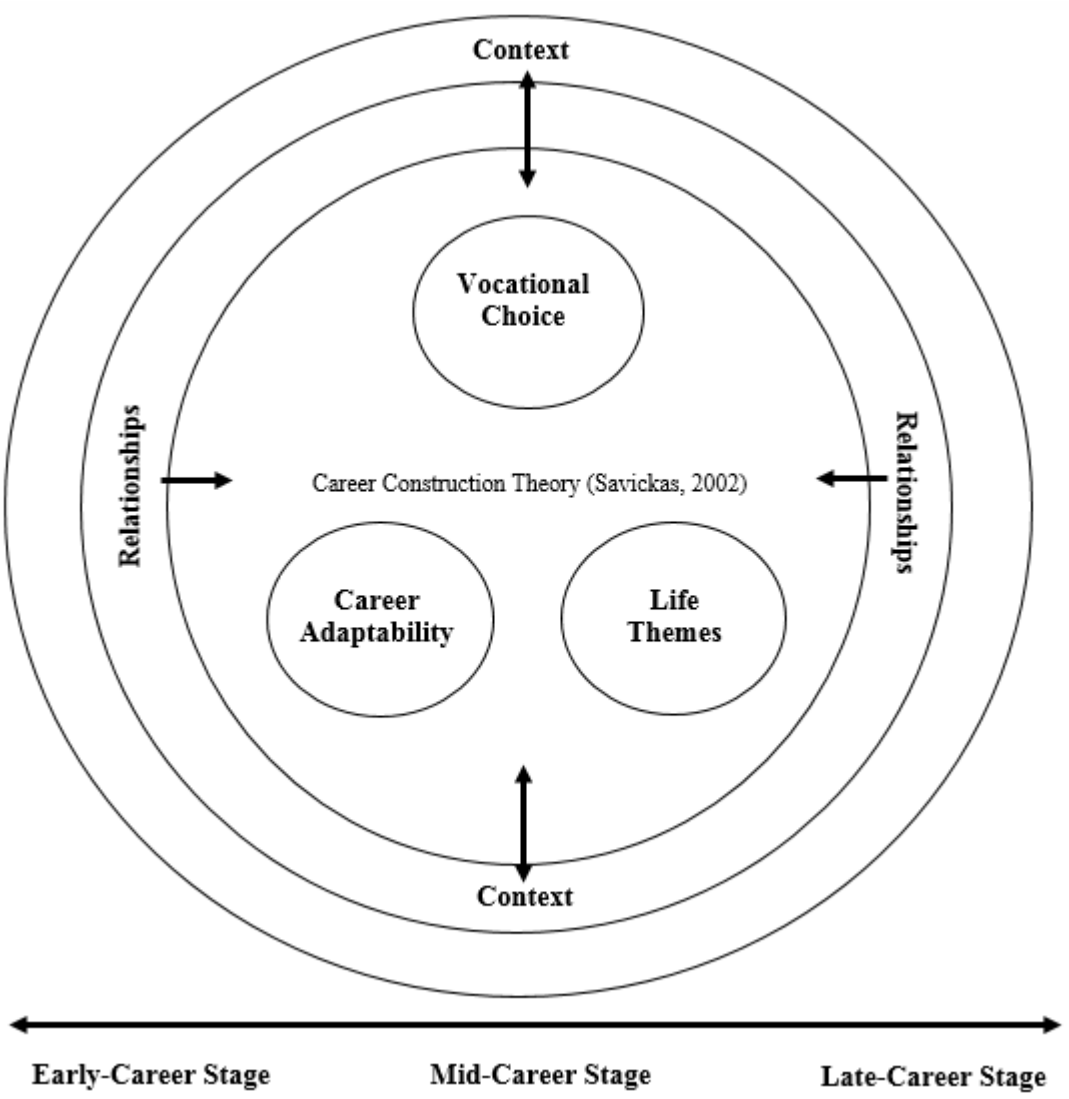


Figure 5. A new conceptual framework of career construction.

Study Limitations and Recommendations for Future Research

Like any other studies, this study has its own limitations. First, at the sampling phase, I encountered numerous recruitment challenges in Lebanon and had to rely heavily on snowball sampling. This sampling strategy caused a cohort network effect on

this study, as evidenced by eight of my study participants sharing the experience of participating in the same Techwoman program in the U.S. As a result, I am uncertain to what extent this shared experienced influenced my findings about women's career experiences in STEM in Lebanon. Second, most of my participants come from a middle to an upper socio-economic background and almost half of them hold a graduate degree. In this sense, the women I interviewed represent an elite group in the workforce and in the Lebanese society in general. What they have experienced in their STEM careers (their career decision, access to STEM, and career experiences) may be different from the women with lower socio-economic or educational status. For this reason, any generalization of my study findings to other groups of STEM women in Lebanon must be handled with caution. Nevertheless, each of the limitations of the study also presents an opportunity for future research. Below I will discuss six areas for further investigations, both conceptually and methodologically.

First, this study focused exclusively on women who are currently employed. I encourage future research to examine the persistence of women careers in STEM fields. Particularly, it will be very helpful to look at women who are at an advanced career stage or in senior positions to understand what has enabled them to stay in a male-dominated field for a long period of time and what has contributed to their career progression. Along the same line, researchers can take a closer look at women's career experiences in different STEM disciplines. By understanding women's participation in specific disciplines, we will gain a better appreciation for the context and discipline sensitive influencers. Further research can also investigate the role of career construction in the

careers of women in STEM at different phases of their lifespan (i.e., early, middle, late adulthood; Zacher & Griffin, 2015).

Second, considering the elite nature of STEM professions, there is a need for studies that investigate the influence of the socio-economic status and other demographic variables on the career choices and experiences of women in STEM. This will allow us to better understand whether there are within-group and across-group differences.

Third, more research is needed to compare the careers of women in different groups, for example women who have opted to exit STEM careers, women who never entered STEM careers, and women who have managed to succeed in STEM careers. These type of comparative studies will enhance our understanding of the career facilitators or inhibitors. Further research can also explore the effectiveness of career construction counseling interventions for different groups of clients, as well as the conditions and outcomes of such interventions (Rudolph et al., 2018).

Fourth, in terms of the research setting, future research should take into account the influence of the national context on women's career choices and experiences. This study focused on one specific context, Lebanon, and it will be interesting to conduct cross-national comparisons to determine if the findings from this study applies to other national contexts that share similar cultural characteristics. On the other hand, it will be equally meaningful to compare and contrast STEM careers of women in countries that present strikingly different cultural values.

Fifth, another area that is worth effort is to develop a matrix system based on the conceptual model (Figure 4) in order to move from a societal observation to corporate

action. In other words, use the empirical evidence generated from this study as a base to develop practical interventions for organizations in STEM fields. For example, identify ways to measure the various influencers and interactions while keeping organizational risk and reward in mind. To achieve this goal, researchers and practitioners can collaborate to translate the conceptual model developed from this study into a practical measurement tool for STEM organizations.

Finally, methodologically, this study demonstrated one approach to study women's career experiences in STEM—basic qualitative interpretive study. I urge researchers to embrace other qualitative research methodologies such as multiple case studies, phenomenology, and grounded theory and also mixed method studies that will provide fresh insights. In addition, longitudinal studies are needed to provide a holistic understanding of women's career over a life-span. By the same token, cross-sectional studies will also generation context-sensitive perspectives of women's career experiences in different STEM disciplines.

Conclusion

For a field such as HRD where career development is considered as one of the core domains, furthering conversations about careers and career development is not only relevant, but also necessary. As HRD scholars and practitioners have commonly recognized, HRD can play a key role in creating and developing career strategies that are attuned to the changing nature of work and careers (Burke & Ng, 2006; Kimberly & Hite, 2018)– while also recognizing the heterogeneity within our conventional understanding of the concept of careers. It is within this heterogeneous perspective that

my study lies. As such, my study and the two models presented earlier expands our current knowledge about HRD by highlighting the importance of understanding the career experiences of women who work in highly masculinized occupations. It is with this new insight that we will be able to move away from a linear and masculine understanding of careers to one that takes into account the context where careers are constructed with different meanings. This is highly pertinent to the HRD discipline because contextualizing knowledge and experiences will allow for more context-sensitive research and practice that focus on career issues of high relevance and importance.

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APPENDIX A

Email flyer

Subject: Help Needed for Dissertation Research Study

Hello!

You are invited to take part in a research study (IRB-xxxxxxxxx) conducted by Dr. Jia Wang (associate professor) and Yasmeen Makarem (doctoral student) from the Department of Educational Administration & Human Resource Development (EAHRD) at Texas A&M University.
This study focuses on the career experiences of women in Science, Technology, Engineering and Math (STEM) fields in Lebanon.
The Institutions Review Board (IRB) at Texas A&M University that enforces ethical conduct in research has approved this study and ensures that participation in voluntary and confidential. The attached information sheet provides complete information.
If you volunteer to help this study, you will be asked to take part in a 1-2 hours face-to-face or Skype interview. Please know that your anonymity will be maintained at all times and no comments will be ascribed to you by name in any written document or verbal presentation. Nor will any data be used from the interview that might identify you to a third party.
Please contact Yasmeen Makarem (yasmeenmakarem@tamu.edu) if you are willing to participate and meet the following criteria:

1. Born and raised in Lebanon
2. Be a female
3. Work in one of the STEM fields in Lebanon for a minimum of 8-10 years
4. Employed at the time of the study

If you don't meet the criteria, but know a woman professional who may meet the above countries, we would really appreciate if you forward this email to them.
Thank you for taking the time to read this email. If you have any questions please contact Yasmeen Makarem (yasmeenmakarem@tamu.edu) or Dr. Jia Wang (jia.wang@tamu.edu).

Yasmeen Makarem
Ph.D. Candidate, Graduate Research Assistant
Department of Educational Administration and Human Resource Development
College of Education | Texas A&M University

APPENDIX B

Recruitment Flyer

Invitation to Research Participation

Women in STEM Careers

You are invited to take part in a research study (IRB-xxxxxxxxx) conducted by Dr. Jia Wang (associate professor) and Yasmeen Makarem (doctoral student) from the Department of Educational Administration & Human Resource Development (EAHRD) at Texas A&M University.

This study focuses on the career experiences of women in Science, Technology, Engineering and Math (STEM) fields in Lebanon.

If you are willing to participate and meet the following criteria:

1. Born and raised in Lebanon
2. Be a female
3. Work in one of the STEM fields in Lebanon for a minimum of 8-10 years
4. Employed at the time of the study

If you volunteer to help this study, please contact Yasmeen Makarem

(yasmeenmakarem@tamu.edu). Before you agree to participate, please note that:

- The Texas A&M University's Institutional Review Board that enforces ethical conduct in research has approved this study.
- You will be asked to take part in a 1-2 hours face-to-face or Skype interview.
- Your anonymity will be maintained at all times and no comments will be ascribed to you by name in any written document or verbal presentation. Nor will any data be used from the interview that might identify you to a third party.
- You will be free to withdraw from the research at any time and/or request that your transcript not be used.

If you have any queries concerning the nature of the research or are unclear about the extent of your involvement in it please contact the Yasmeen Makarem (yasmeenmakarem@tamu.edu) or Dr. Jia Wang (jiawang@tamu.edu).
We sincerely hope that you will be able to help us with this research.

APPENDIX C

Information sheet

Project Title: **The Career Experiences on Women in STEM Fields in Lebanon**

You are invited to take part in a research study being conducted by Yasmeen Makarem, a PhD student, and Dr. Jia Wang, an associate professor from Texas A&M University, College of Education and Human Development. **The information in this form is provided to help you decide whether or not to take part. If you decide to take part in the study, you will be asked to sign this consent form. If you decide you do not want to participate, there will be no penalty to you, and you will not lose any benefits you normally would have.**

Why Is This Study Being Done?
The purpose of this study is to explore the career experiences of women in STEM fields in Lebanon.

Why Am I Being Asked To Be In This Study?
You are being asked to be in this study because you (1) were born and raised in Lebanon, (2) are a female (3) worked in any of the STEM fields in Lebanon for 8-10 years and (4) are currently employed at the time of the study.

How Many People Will Be Asked To Be In This Study?
Ten to one hundred participants will be invited to participate in this study locally.

What Are the Alternatives to being in this study?
The alternative to being in the study is not to participate. No other activity will be given if you choose not to participate.
This is not a study that gives course credit.
This is not a treatment study.

What Will I Be Asked To Do In This Study?
You will be asked to take part in a face-to-face or Skype interview, which lasts one-two hours.
A short follow-up interview may be conducted face-to-face or by phone or email.
You may also be asked to review the transcript of your own interview afterwards.
Participation in this study will last up two hours and includes maximum of two visits.

Visit 1
This visit will last one-two hours. During the first visit the interviewer (the PI or the co-PIs) will introduce the study briefly and walk you through the consent form. You will be provided time (as much as you require) to read through the consent form and ask any

question. After you signed the consent form, the PI or the protocol directors, proceed with the interview.

Visit 2
If the PI or protocol directors had questions about the interview or needed clarification about the interview, they may contact you and ask for a second visit. During the second visit, the PI or protocol directors will ask questions they have regarding the first visit. These questions may be asked through a telephone call or email.

Are There Any Risks To Me?
The things that you will be doing are no more/greater than risks than you would come across in everyday life. There are no physical, criminal, social, financial, economic, and psychological risks. The only risk would be the breach of privacy or confidentiality. Although the researchers have tried to avoid risks, you may feel that some questions/procedures that are asked of you will be stressful or upsetting. You do not have to answer anything you do not want to.

Are There Any Benefits To Me? (If there are no direct benefits, this section may be omitted)***
The direct benefit to you by being in this study is you will have a chance to reflect on your career experiences.

Will There Be Any Costs To Me?
Aside from your time, there are no costs for taking part in the study.

If you suffer any injury as a result of taking part in this research study, please understand that nothing has been arranged to provide free treatment of the injury or any other type of payment. However, all needed facilities, emergency treatment and professional services will be available to you, just as they are to the community in general. You should report any injury to 979-219-7475. You will not give up any of your legal rights by signing this consent form.

Will Information From This Study Be Kept Private?
The records of this study will be kept private. No identifiers linking you to this study will be included in any sort of report that might be published. Research records will be stored securely and only Dr. Jia Wang and Yasmeen Makarem will have access to the records.

Information about you will be stored in locked file cabinet; computer files protected with a password. This consent form will be filed securely in an official area.

People who have access to your information include the Principal Investigator and research study personnel. Representatives of regulatory agencies such as the Office of Human Research Protections (OHRP) and entities such as the Texas A&M University

Human Subjects Protection Program may access your records to make sure the study is being run correctly and that information is collected properly.

The funding agency for this study and the institution(s) where study procedures are being performed (Texas A&M University) may also see your information. However, any information that is sent to them will be coded with a number so that they cannot tell who you are. Representatives from these entities can see information that has your name on it if they come to the study site to view records. If there are any reports about this study, your name will not be in them.

Information about you and related to this study will be kept confidential to the extent permitted or required by law.

Who may I Contact for More Information?
You may contact the Principal Investigator, Jia Wang, Ph.D., to tell her about a concern or complaint about this research at 979-862-7808 or jiawang@tamu.edu . For alternate contact you may also contact the protocol director, Yasmeen Makarem at 980-622-3929 or yasmeenmakarem@tamu.edu .

For questions about your rights as a research participant, to provide input regarding research, or if you have questions, complaints, or concerns about the research, you may call the Texas A&M University Human Subjects Protection Program office by phone at 1-979-458-4067, toll free at 1-855-795-8636, or by email at irb@tamu.edu.

What if I Change My Mind About Participating?
This research is voluntary and you have the choice whether or not to be in this research study. You may decide to not begin or to stop participating at any time. If you choose not to be in this study or stop being in the study, there will be no effect on your student status, medical care, employment, evaluation, relationship with Texas A&M University, etc. Any new information discovered about the research will be provided to you. This information could affect your willingness to continue your participation.

By participating in the interview(s), you are giving permission for the investigator to use your information for research purposes.

Thank you.

Jia Wang and Yasmeen Makarem

APPENDIX D

Consent form

Project Title: **The Career Experiences on Women in STEM Fields in Lebanon**

You are invited to take part in a research study being conducted by Yasmeen Makarem a PhD student, and Dr. Jia Wang, an associate professor from Texas A&M University, College of Education and Human Development. **The information in this form is provided to help you decide whether or not to take part. If you decide to take part in the study, you will be asked to sign this consent form. If you decide you do not want to participate, there will be no penalty to you, and you will not lose any benefits you normally would have.**

Why Is This Study Being Done?
The purpose of this study is to explore the career experiences of women in STEM fields in Lebanon.

Why Am I Being Asked To Be In This Study?
You are being asked to be in this study because you (1) were born and raised in Lebanon, (2) are a female (3) worked in any of the STEM fields in Lebanon for 8-10 years and (4) are currently employed at the time of the study.

How Many People Will Be Asked To Be In This Study?
Ten to one hundred participants will be invited to participate in this study locally.

What Are the Alternatives to being in this study?
The alternative to being in the study is not to participate. No other activity will be given if you choose not to participate.
This is not a study that gives course credit.
This is not a treatment study.

What Will I Be Asked To Do In This Study?
You will be asked to take part in a face-to-face or Skype interview, which lasts one-two hours.
A short follow-up interview may be conducted face-to-face or by phone or email.
You may also be asked to review the transcript of your own interview afterwards.
Participation in this study will last up two hours and includes maximum of two visits.

Visit 1
This visit will lasts one-two hours. During the first visit the interviewer (the PI or the co-PIs) will introduce the study briefly and walk you through the consent form. You will be provided time (as much as you require) to read through the consent form and ask any

question. After you signed the consent form, the PI or the protocol directors, proceed with the interview.

Visit 2
If the PI or protocol directors had questions about the interview or needed clarification about the interview, they may contact you and ask for a second visit. During the second visit, the PI or protocol directors will ask questions they have regarding the first visit. These questions may be asked through a telephone call or email.

Will Photos, Video or Audio Recordings Be Made Of Me during the Study?
Your participation in the interview will be audio recorded with your permission.

The researchers will make an audio recording during the study so that the interview can be transcribed verbatim. The researchers will take notes of your comments during the interview, if you do not give permission for the audio recording to be obtained.

The researchers will make an audio recording during the study so that the interview can be transcribed verbatim only if you give your permission to do so. Indicate your decision below by initialing in the space provided.

_____ I give my permission audio recordings to be made of me during my participation in this research study.
_____ I do not give my permission for audio recordings to be made of me during my participation in this research study.

Are There Any Risks To Me?
The things that you will be doing are no more/greater than risks than you would come across in everyday life. There are no physical, criminal, social, financial, economic, and psychological risks. The only risk would be the breach of privacy or confidentiality. Although the researchers have tried to avoid risks, you may feel that some questions/procedures that are asked of you will be stressful or upsetting. You do not have to answer anything you do not want to.

Are There Any Benefits To Me? (If there are no direct benefits, this section may be omitted)***
The direct benefit to you by being in this study is you will have a chance to reflect on your career experiences.

Will There Be Any Costs To Me?
Aside from your time, there are no costs for taking part in the study.

If you suffer any injury as a result of taking part in this research study, please understand that nothing has been arranged to provide free treatment of the injury or any other type

of payment. However, all needed facilities, emergency treatment and professional services will be available to you, just as they are to the community in general. You should report any injury to 979-219-7475. You will not give up any of your legal rights by signing this consent form.

Will Information From This Study Be Kept Private?
The records of this study will be kept private. No identifiers linking you to this study will be included in any sort of report that might be published. Research records will be stored securely and only Dr. Jia Wang and Yasmeen Makarem will have access to the records.

Information about you will be stored in locked file cabinet; computer files protected with a password. This consent form will be filed securely in an official area.

People who have access to your information include the Principal Investigator and research study personnel. Representatives of regulatory agencies such as the Office of Human Research Protections (OHRP) and entities such as the Texas A&M University Human Subjects Protection Program may access your records to make sure the study is being run correctly and that information is collected properly.

The funding agency for this study and the institution(s) where study procedures are being performed (Texas A&M University) may also see your information. However, any information that is sent to them will be coded with a number so that they cannot tell who you are. Representatives from these entities can see information that has your name on it if they come to the study site to view records. If there are any reports about this study, your name will not be in them.

Information about you and related to this study will be kept confidential to the extent permitted or required by law.

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You may contact the Principal Investigator, Jia Wang, Ph.D., to tell her about a concern or complaint about this research at 979-862-7808 or jiawang@tamu.edu. For alternate contact you may also contact the protocol director, Yasmeen Makarem at 980-622-3929 or yasmeenmakarem@tamu.edu .

For questions about your rights as a research participant, to provide input regarding research, or if you have questions, complaints, or concerns about the research, you may call the Texas A&M University Human Subjects Protection Program office by phone at 1-979-458-4067, toll free at 1-855-795-8636, or by email at irb@tamu.edu.

What if I Change My Mind About Participating?
This research is voluntary and you have the choice whether or not to be in this research study. You may decide to not begin or to stop participating at any time. If you choose not to be in this study or stop being in the study, there will be no effect on your student

status, medical care, employment, evaluation, relationship with Texas A&M University, etc. Any new information discovered about the research will be provided to you. This information could affect your willingness to continue your participation.

STATEMENT OF CONSENT

I agree to be in this study and know that I am not giving up any legal rights by signing this form. The procedures, risks, and benefits have been explained to me, and my questions have been answered. I know that new information about this research study will be provided to me as it becomes available and that the researcher will tell me if I must be removed from the study. I can ask more questions if I want, and I can still receive services if I stop participating in this study. A copy of this entire consent form will be given to me.

Participant's Signature _____ Date _____

Printed Name _____ Date _____

INVESTIGATOR'S AFFIDAVIT:
Either I have or my agent has carefully explained to the participant the nature of the above project. I hereby certify that to the best of my knowledge the person who signed this consent form was informed of the nature, demands, benefits, and risks involved in his/her participation.

Signature of Presenter _____ Date _____

Printed Name _____ Date _____

APPENDIX E

The interview guide

Opening question:

1. Tell me about yourself.

Key questions:

2. Tell me about your professional experience in Lebanon:
   Probes:
   - Please describe a typical day in your professional role in your organization

3. What inspired you to pursue a career in STEM?
   Probe:
   - Why did you choose … (e.g. engineering, math, science…)?
   - What experiences contributed to your decision to pursue your occupation?

4. Now let's reflect on your career experiences:
   Probe:

   - What are your most proud moments while working?
     - Can you share a specific example of your accomplishments?
     - What helped you achieve your goals?
   - What challenges do you face?
     - How did you cope with those challenges?

Transition questions:

5. Based on everything we have talked about; how would you characterize your career experience?
6. Why do you think that so few women pursue mathematical-related careers? What could be or should be done to alter that?
7. Based on your experience, what advice would you give a woman who wants to pursue a career in STEM?
8. If you were to start over again, what would you do differently?

Ending question:

9. Is there anything that else you would want to add to what we are talking about today?

Note: Thank you so much for your participation. I will go back and transcribe this interview and send you a copy of the transcript for you to check if it captures what you wanted to communicate. If further clarifications were needed, I may come back for a brief meeting or send you an email with follow up questions.

APPENDIX F

IRB Approval Form

APPROVAL OF RESEARCH

Using Expedited Procedures

December 13, 2017

Type of Review:	Initial Review Submission Form
Title:	The Career Experiences of Women in STEM Fields in Lebanon
Investigator:	Jia Wang
IRB ID:	IRB2017-0809D
Reference Number:	066986
Funding:	None
Documents Approved:	Recruitment Flyer Recruitment Email Consent Form LinkedIn and FB Recruitment Email for LLWB Interview Questions
Special Determinations:	None
Review Category:	Category 7: Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Dear Jia Wang:

The IRB approved this research from 12/13/2017 to 12/12/2018 inclusive.

It is recommended that you submit your next continuing review by to avoid a lapse in approval.

Your study approval will end on 12/12/2018.

Your study must maintain an approved status as long as you are interacting or intervening with living individuals or their identifiable private information or identifiable specimens. Obtaining identifiable private information or identifiable specimens includes, but is not limited to: 1. using, studying, or analyzing for research purposes identifiable private information or identifiable specimens that have been provided to investigators from any source; and 2. using, studying, or analyzing for research purposes identifiable private information or identifiable specimens that were already in the possession of the investigator.

In general, OHRP considers private information or specimens to be individually identifiable as defined at 45 CFR 46.102(f) when they can be linked to specific individuals by the investigator(s) either directly or indirectly through coding systems.

If you have any questions, please contact the IRB Administrative Office at 1-979-458-4067, toll free at 1-855-795-8636.

Sincerely,

IRB Administration

APPENDIX G

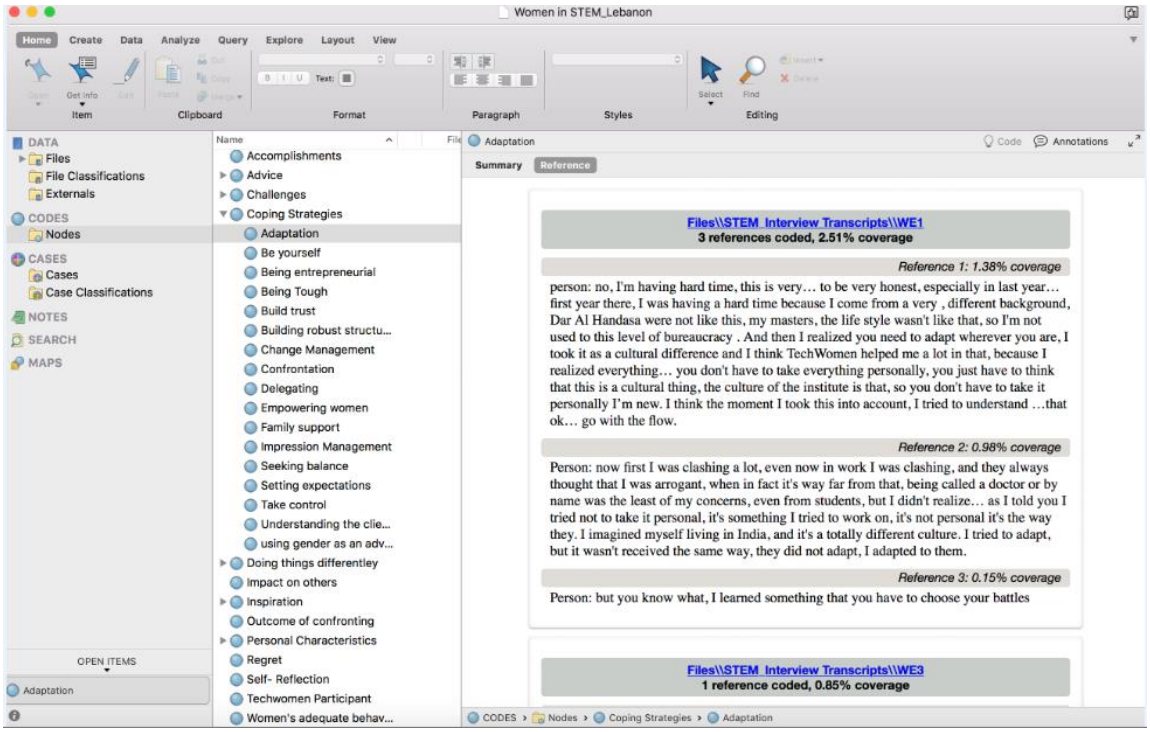
Sample of Member Checking

“Thank you for reaching out to me Yasmeen. I read through your findings section and I have some comments on it. I think it is very important that you have more subcategories in your coping section. It is very important to highlight at first the women’s resilience in coping with their challenges and then mention that some of the women decided to adapt to their organizational cultures at the end of that section and not at the beginning”.

(Dima)

APPENDIX H

Sample of Data Organization and Analysis/ Nvivo



APPENDIX I

Sample of Reflective Journal

"Today, I met with one of the women who works in the automation sector in Lebanon. I was completely blown away by her! She is a go-getter, completely focused on her growing her subsidiary! Also her office was stunning! She designed the office with all the tools you could find in a car garage. She is also immensely proud of her accomplishments and how she is breaking barriers. Also, she told me how she hires women in her office and works on empowering them. I honestly didn't expect that and was completely surprised. I was so proud of what she is doing and I couldn't hide my feelings! June 15, 2018."